# SPECIFICATIONS (FOR CONSTRUCTION OF)

**SOLICITATION NO. DACA45 03-R-0051** 

# REPLACE HYDRANT FUEL SYSTEM SGBP 050017



OFFUTT AFB, Nebraska

# **SECTION 02316 ATTACHMENTS**

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HARDFILL 2 COMPOSITE SITE PLAN
AND BORING LOGS

APPENDIX B
SITE PLANS AND PLUME INFORMATION

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CONTAMINATION INVESTIGATION REPORT



# REPLACE HYDRANT FUEL SYSTEM OFFUTT AFB, NEBRASKA

#### **SECTION 02316 ATTACHEMENTS**

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HGS	HISTORICAL GROUNDWATER SAMPLING

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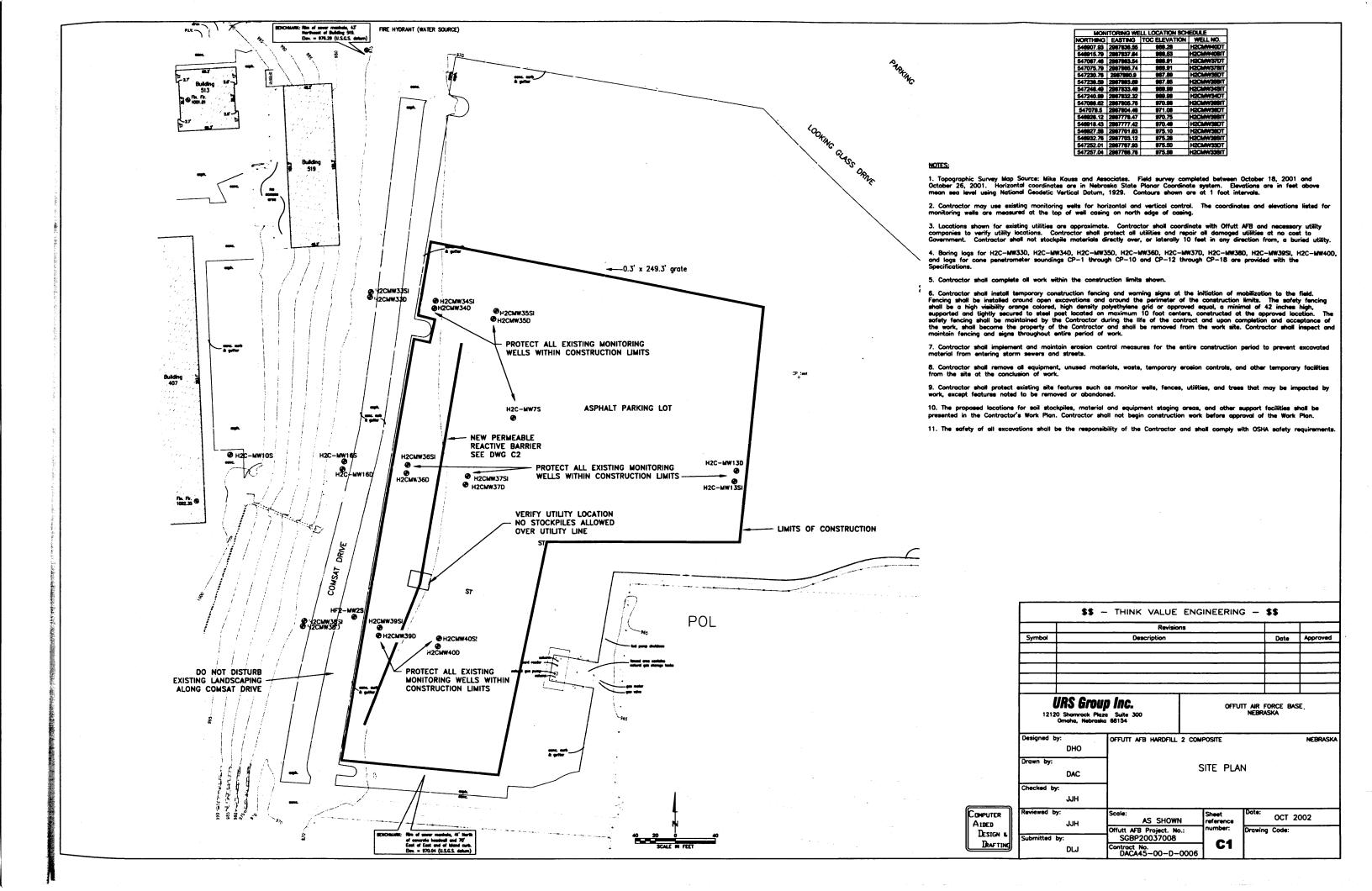
### APPENDIX A

# HARDFILL 2 COMPOSITE SITE PLAN AND BORING LOGS

SITEP HARDFILL 2 COMPOSITE SITE PLAN

H2C-MW38D BORING LOGS - H2C-MW38D H2C-MW39D BORING LOGS - H2C-MW39D H2C-MW40D BORING LOGS - H2C-MW40D







HTRW DRILLING LOG DISTRICT HOLE NUMBER **USACE Omaha District** 1. COMPANY NAME H2C-MW38D HEETS 2. DRILLING CONTRACTOR URS Corporation SHEET SHEETS Coranco 3. PROJECT OF 5 4. LOCATION OFFUTT FY01 - HF2C PRB PRE-DESIGN Offutt AFB, Nebraska 5. NAME OF DRILLER 6. MANUFACTURER'S DESIGNATION OF DRILL T. Malosek Mobile B-57 7. SIZES AND TYPES OF DRILLING 8-1/4" HSA (OD), AW Rods, 2" Split AND SAMPLING EQUIPMENT **8. HOLE LOCATION** Spoon, 3" Split Spoon H2C Parking Lot 30 9. SURFACE ELEVATION 970.0 10. DATE STARTED 11. DATE COMPLETED 5/3/01 12. OVERBURDEN THICKNESS 5/3/01 15. DEPTH GROUNDWATER ENCOUNTERED N/A 14.0 13. DEPTH DRILLED INTO ROCK 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED NA 6.2 @ 39 days 14. TOTAL DEPTH OF HOLE 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) 36.0 18. GEOTECHNICAL SAMPLES (TESTED) N/A DISTURBED UNDISTURBED 19. TOTAL NUMBER OF CORE BOXES 20. SAMPLES FOR CHEMICAL ANALYSIS N/A VOC METALS OTHER (SPECIFY) OTHER (SPECIFY) OTHER (SPECIFY) None 21. TOTAL CORE 21. IUI. RECOVERY N/A NA NA 22. DISPOSITION OF HOLE N/A N/A BACKFILLED MONITORING WELL OTHER (SPECIFY) 23. SIGNATURE OF Monitoring Well NA H2C-MW38D N/A LOCATION SKETCH/COMMENTS SCALE: 1" = H2C-CP13 △ H2C-CP3 H2C-MW10S **△** H2C-G\$135  $\oplus$ H2C-MW16S **HP21●** △ H2C-CP8 ♣ H2C-MW36SI
♣ H2C-MW36D H2C-MW16D 1 H2C-MW37SI H2C-MW37D STAIRS HF2-TW3 H2C-CP14 H2C-GS136 ⊕ H2C-△ H2C-CP4 A H2C-CP7 ⊕HF2-MW2S H2C-MW38SI/ H2C-MW39SI H2C-MW39D H2C-MW38D H2C-MW40SI H2C-MW40D PROJECT OFFUTT FY01 - HF2C PRB PRE-DESIGN Offutt AFB, Nebraska HOLE NO H2C-MW38D ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

881

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JEÇT	OFFU	· · · · · · · · · · · · · · · · · · ·	NSPECTOR					H2C-MW38D SHEET SHEET
-	Onut	AFB, Nebraska	J. Covey	GEOTECH SAMPLE	ANALYTICAL		r <del></del>	2 OF 5
ELEV.	DEPTH	DESCRIPTION OF MATERIALS	RESULTS	OR CORE BOX NO.	SAMPLE NO.	BLOW COUNT		REMARKS
(a)	(b)	(c)	(d)	(•)	(f)	(g)		(h)
970.0	٥٦	Silty CLAY (CL) - Soft, dark brown, moist, low plastic, with some organics					Fill	
	E	moist, low plastic, with some organics					Upper sa	ample pushed 2 fee
	∃		]			1.0	' '	
969.0	I₄≓	Becomes medium stiff, brown, with		111				
	'=	trace fine to medium gravel		111		2.0		
	$\exists$	With no gravel	1		ŀ			
		_		{		4.0		
		Becomes stiff		111				
968.0	2			111		\$	R=22/24	
					]	7		
				[1]				
		Becomes very organic	1			10		
967.0	∣ ₃ ⊐		į					
		Becomes light brown, with trace sand and iron staining				12		
	=	_						
	=	0.5" Seam of trace coarse-grained		114		14		
	│ . 耳	sand and fine gravel		[]]			R=17/24	
966.0	⁴∃						K=1//24	
		Becomes medium stiff	į			3		
	I ≓	Dodding Miles						
						5		
965.0	5_	2" Seam of trace very fine sand	HS=10.9					
	=					6		
1	=	Becomes black, medium plastic, with						
		trace organics		111		9		
964.0						s	R=17/24	
304.0	°≒					3	11724	
	$\equiv$	Pagaman auf						
		Becomes soft				_		
						3		
963.0	7_							
	=	Becomes grayish-brown, with trace		] }		2		
	ヨ	very fine-grained sand						
						4		
962.0	8 =				[	s	R=17/24	
	ı∃	•				1		
	⊒			[[]				
	ı ≓	Silly CLAY (CL) A4-45	_	Щ		2		
961.0	I ,∃	Silty CLAY (CL) - Medium stiff, light brownish-gray, moist, low plastic, with		//	]		Peorian I	Loess
<b>301.</b> U	<u>*</u>	trace calcite concretions	[	レン		2		
		·			]	3		
				Y/.	]	_		
	=			//		4		
960.0	10_=		HS=12.6		1i	S	R=18/24	
OJEC		TT EVA1 - UE20 BBB BBC BESICE C				HOLE N		
		TT FY01 - HF2C PRB PRE-DESIGN C A-R, AUG 94	niuπ AFB, Neb	raska		1	H2C	-MW38D onent: CECW-EG

/38D SHEETS

I 2 feet

958.0 12_ 955.0 15_ 952.0 18_ 952.0 18_	Dffutt / (b) 10	TT FY01 - HF2C PRB PRE-DESIGN AFB, Nebraska  DESCRIPTION OF MATERIALS (c)  SAME: Silty CLAY (CL) - Medium stiff, light brownish-gray, moist, low plastic, with trace calcite concretions	NSPECTOR  J. COVEY  FIELD SCREENING  RESULTS  (d)	G GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	(g) 1 2	Peorian L	H2C-M SHEET 3 O REMARKS (h) Oess	SHEET
959.0 11_ 957.0 13_ 956.0 14_ 955.0 15_ 954.0 16_ 953.0 17_	PTH (b) 10	DESCRIPTION OF MATERIALS  (c)  SAME: Silty CLAY (CL) - Medium stiff, light brownish-gray, moist, low plastic.	FIELD SCREENING RESULTS (d)	OR CORE BOX NO.	SAMPLE NO.	(g) 1 2	Peorian L	REMARKS (h)	F 5
(a) (b) 960.0 10	(b) 10	SAME: Silty CLAY (CL) - Medium stiff, light brownish-gray, moist, low plastic	RESULTS (d)	OR CORE BOX NO.	SAMPLE NO.	(g) 1 2	Peorian L	(h)	
959.0 11_ 959.0 11_ 958.0 12_ 957.0 13_ 956.0 14_ 955.0 15_ 954.0 16_	10	SAME: Silty CLAY (CL) - Medium stiff, light brownish-gray, moist, low plastic	(d)	1	1	(g) 1 2	Peorian L	(h)	
959.0 11_ 958.0 12_ 957.0 13_ 956.0 14_ 955.0 16_ 953.0 17_	11 11 11 11 11 11 11 11 11 11 11 11 11	SAME: Silty CLAY (CL) - Medium stiff, light brownish-gray, moist, low plastic				1 2 1	Peorian L		
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957.0 13_ 956.0 14_ 955.0 15_ 954.0 16_					<b>/</b>	2			
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955.0 15_ 955.0 16_ 953.0 17_				1 1/	1		R=23/24		
955.0 15_ 955.0 16_ 953.0 17_	1111111111111			I [/	1	2			
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955.0 15_ 955.0 16_ 953.0 17_	13		ļ	1 //	1 .	3			
955.0 15_ 954.0 16_ 953.0 17_					1 [				
955.0 15_ 954.0 16_ 953.0 17_	=	With iron staining laminations	1		1	4			
955.0 15_ 954.0 16_ 953.0 17_	$\exists$	That non stanning landinations			)				
955.0 15_ 954.0 16_ 953.0 17_		Becomes gray			<b>a</b> 1	_			
955.0 15_ 954.0 16_ 953.0 17_	コ	Decomes gray		V/	4	5			
954.0 16_ 953.0 17_	4				1	S	R=19/24		
954.0 16_ 953.0 17_	$\exists$	Silty CLAY (CL) - Soft, greenish-gray,	7		1	1	Alluvial Si	It and Clay	,
954.0 16_ 953.0 17_	7	wet, low plastic		-	1	•		iii ana olay	
954.0 16_ 953.0 17_	ㅋ			<u>                                   </u>	1				
954.0 16_ 953.0 17_	⊣				1 ]	2			
954.0 16_ 953.0 17_	<sub>15</sub> 국	Becomes blackish-brown	HS=0.9	l L=	1				
953.0 17_	~ =			l (=	- I	2	[		
953.0 17_	日			I [=	-l	-			
953.0 17_	크			I [=	-				
953.0 17_	ヸ	Becomes medium stiff, dark gray			4 l	4			
953.0 17_	ا ۾			!	1	s	R=21/24		
	' <b>`</b> ≒	With trace calicite concretions		<u>                                   </u>	<b>.</b>	3			
	=	The field delicite collections		l <u>-</u>	_	3			
	ゴ			<u>                                   </u>	]				
	⇉	Becomes light gray and sandy		<u> </u>	]	5			
	ᇽ╡	boomico ngint gray and sandy		- <u>-</u>	] ]				
952.0 18_	'≒			l ⊢ <u>−</u>			•		
952.0 18_	ユ			-	1	9			
952.0 18_	$\exists$	SAND (SP) - Poorly-graded, medium	$\Box$		3		Terrace \$	and	
952.0 18	⇉	dense, light gray and white, wet, fine-	1	l 💹	<b>a</b> (	11	:		
952.0 18_	ℴℲ	to medium-grained		l 😥	]	s	R=24/24		
<u> </u>	°=1			l 182	}		1164/24		
<u> </u>	╛		1			2			
	コ		1	Geo 🔯	;				
	$\dashv$		ł	<b>├──</b> ───	]	7	[		
054.0			1	🔯	]		{		
951.0 19_				🔯	]	40			
	9==		1	💮	1 1	16			
] ]	9 11 11 11			🌃	]				
		Becomes fine-grained			]	17	1		
050.0	9		UC-4 6	L	]		R=24/24		
<u>950.0                                   </u>			HS=1.6	120	3				
OFF			ffutt AFB, Net	raeka		HOLE N	iO Hac	MW38D	

;W-EG)

(Proponent: CECW-EG)

Down   Scheme   Down	ECT			(CONTINUATION						H2C SHEET	-MW38D	S
December     December   Decembe		Offutt /	AFB, Nebraska	J. Covey						4		1
December												$\dashv$
SAME_SAND (SP) - Poorly-graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, me	ı					X NO.	l	l			S	
Medium dense, light gray and white, wet, fine-grained   99				(a)	(e)	18273	(1)		Torrage			4
949.0 21 Increasing Silt content    Silty CLAY (CL) - Stiff, gray wet, low plastic, with trace fine- to medium-grained sand   20	330.0	⊢ 2°∃			Geo	_		'	remade	Sanu		F
949.0 21 Increasing Silt content    Silty CLAY (CL) - Stiff, gray wet, low plastic, with trace fine- to medium-grained sand		∃	wet, fine-grained									F
Silty CLAY (CL) - Stiff, gray wet, low plastic, with trace fine- to medium-grained sand   16		l ≓						9				F
Silty CLAY (CL) - Stiff, gray wet, low plastic, with trace fine- to medium-grained sand   16	.40.0	୲୷∃										F
Silty CLAY (CL) - Stiff, gray wet, low plastic, with troop fine- to be medium-grained sand   20	949.0	│ <b>-</b> ''	Increasing Silt content					16				F
Plastic, with trace fine- to medium-grained sand   20 S R=17/24			Silty CLAY (CL) - Stiff, gray wet, low			H		, ,	Terrace	Clav		E
948.0 22   medium-grained sand   20   S   R=17/24   947.0 23   SAND with SILT (SP-SM) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained   SAND (SP) - Poorly graded,			plastic, with trace fine- to			//	ł			,		Е
947.0 23 SAND with SILT (SP-SM) - Poorty graded, medium dense, gray, wet, fine-grained  946.0 24			medium-grained sand				1	20				E
947.0 23 SAND with SILT (SP-SM) - Poorly graded, medium dense, gray, wet, fine-grained	948.0	22	0.5" Seam of fine to very fine-grained				]	\$	R=17/24			E
947.0 23 SAND with SILT (SP-SM) - Poorty graded, medium dense, gray, wet, fine-grained  946.0 24			sand					5				F
947.0 23 SAND with SILT (SP-SM) - Poorty graded, medium dense, gray, wet, fine-grained  946.0 24	ļ					人/	1					F
947.0 23 SAND with SILT (SP-SM) - Poorty graded, medium dense, gray, wet, fine-grained  946.0 24	ļ				Gen	1.	]	12				F
946.0 24   Geo   G		∃				-77		13				F
946.0 24   Geo   37   S   R=22/24   945.0 25   HS=2.1   10   944.0 26   S   R=16/24   943.0 27   Geo   15   S   R=16/24   942.0 28   Geo   37   S   R=16/24   943.0 27   SAND (SP) - Poorty graded, medium dense, gray, wet, fine-grained   Geo   15   S   R=16/24   941.0 29   Geo   37   S   R=16/24   942.0 28   S   R=16/24   943.0 29   Geo   S   R=16/24   944.0 29   Geo   S   R=16/24   945.0 29   Geo   G	947.0	23_	SAND with SILT (SP-SM) - Poorly			<u> </u>			Terrace	Sand		F
945.0 24	1	ı ∃	graded, medium dense, gray, wet,			134		26				E
945.0 25		=	ine-grained			漢						E
945.0 24					Geo	18	1	37				F
945.0 25						189			D=22/24			E
944.0 26	946.0	24							K=22124	•		Ļ.
944.0 26								6				F
944.0 26												F
944.0 26		$\vdash$				- ₹		7				-
944.0 26				⊔c-2 1								F
944.0 26 SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained Geo 15 R=16/24  942.0 28 Secomes dense 31 Secomes dense 20 Secomes dense 31 Secomes dense 32 Secomes dense 32 Secomes dense 31 Secomes dense 32 Secomes d	945.0	25		П3=2.1				10				E
943.0 27		∃				- Ş.		10				E
943.0 27		=				132						E
943.0 27		í 🗆						21				E
943.0 27	944.0	26 =				- 154v		s	R=16/24	i		F
943.0 27 6 10 10 15 SAND (SP) - Poorly graded, medium dense, gray, wet, fine-grained	344.0	20=				32						F
943.0 27						172	ļ	_				11111111111
943.0 27						- 13°		_				F
942.0 28 Becomes dense  941.0 29 20 25 R=10/24  ROJECT 10 10 10 10 15		=				13.4	1	6				F
942.0 28 Becomes dense  941.0 29 20 25 R=10/24  ROJECT 10 10 10 10 15	943.0	27 □				133						F
942.0 28 S R=16/24  941.0 29 S R=10/24  PROJECT HOLE NO	-	l ∃						10				E
942.0 28 S R=16/24  941.0 29 S R=10/24  PROJECT HOLE NO		∃	SAND (SP) - Poorly graded medium		<u> </u>	150	1					E
942.0 28		=	dense, gray, wet, fine-grained	}	Geo		1	15				F
941.0 29 Becomes dense 28 31 20 25 S R=10/24 ROJECT		=	_, g,, g			_ ``	1	1	D-40-			F
941.0 29 31 20 25 S R=10/24 ROJECT HOLE NO	942.0	28		1			1		K=16/24	•		F
941.0 29 = Becomes dense 20 20 25 S R=10/24 ROJECT			·				1	28	1			F
941.0 29 = Becomes dense 20 20 25 S R=10/24 ROJECT							1					E
941.0 29 = Becomes dense 20 20 25 S R=10/24 ROJECT		=	Pagamas danas				]	31				E
20 25 S R=10/24 ROJECT	044.0	=	becomes dense			2	]					E
940.0 30 S R=10/24  ROJECT HOLE NO	941.0	29						20				上
940.0 30 S R=10/24 ROJECT HOLE NO		=		l l			]	20	ļ			F
940.0 30 S R=10/24 ROJECT HOLE NO							1		}			F
ROJECT							1	25				F
ROJECT	040.0	20 -					1	s	R=10/24	ı		F
	340.0	1 <u>30                                    </u>	<u> </u>		<u> </u>	1/4/	<u>1</u>	J				十
OFFUTT FY01 - HF2C PRB PRE-DESIGN Offutt AFB, Nebraska H2C-MW38D			JTT FY01 - HF2C PRB PRE-DESIGN	Offutt AFB, Net	oraska			1	H20	-MW38	D	

HOLE NUMBER HTRW DRILLING LOG (CONTINUATION SHEET) H2C-MW38D PROJECT INSPECTOR OFFUTT FY01 - HF2C PRB PRE-DESIGN SHEET EETS Offutt AFB, Nebraska J. Covey 5 OF FIELD SCREENING GEOTECH SAMPLE ANALYTICAL DEPTH ELEV. **DESCRIPTION OF MATERIALS** RESULTS OR CORE BOX NO. SAMPLE NO. **BLOW COUNT** REMARKS (a) **(b)** (d) (g) (h) 940.0 30 SAME: SAND (SP) - Poorly graded, 32 Terrace Sand dense, gray, wet, fine-grained 78 939.0 80 Geo 77 S3 R=13/24 938.0 5 Becomes medium to coarse-grained 10 sand with trace fine gravel Geo 937.0 16 22 Silty CLAY (CL) - Hard, greenish-gray, Glacial Till moist, medium plastic, with trace S R=19/24 936.0 medium- to coarse-grained sand 13 24 935.0 38 Becomes gray 56 Geo S R=24/24 934.0 Bottom of Boring @ 36.0' Screen Interval from 28.5 to 33.3 ft. bgs. 933.0 932.0 931.0 930.0 PROJECT **HOLE NO** OFFUTT FY01 - HF2C PRB PRE-DESIGN Offutt AFB, Nebraska H2C-MW38D ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG) 1-EG)

D



JECT	OFFU <sup>*</sup> Offutt	ITT FY01 - HF2C PRB PRE-DESIGN AFB, Nebraska	SPECTOR  J. Covey					SHEET SHEE	- 1
			FIELD SCREENING				T		$\dashv$
ELEV.	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	RESULTS (d)	OR CORE BOX NO. (e)	SAMPLE NO.	BLOW COUNT	1	REMARKS	
970.0	0 _	Asphalt	(=/	(6)	100		Pavemen	nt	+
1	i ∃	1	'		4			•	þ
1	1 7	Silty CLAY (CL) - Very stiff, brown	- '	П	.1	'	Filt		E
	E. 1	with trace gray mottling, moist, low	'	1 ]][	. [		( "		F
969.0	<b>'</b> ∃	plastic	'		,	'	1		E
	I I	ĺ	'			'	1		E
	-	i	'		,	'	1		þ
		1" Seam of greenish-gray		1	.		1		E
968.0	2-	1	'	1 111			1		þ
		With trace calclite concretions			, [	'	1		E
	一日		1	111	,	. '	1		E
	E	1	!		,	'	1		E
967.0	3	1	'		.   -	1	1		E
		1	'		. ]	1	1		
	=	4	'			1	1		
	ı ∃	1	'		. 1	'	1		=
966.0	4_	l	'		,	1	1		E
	l ∃	Daganga stiff alive areas to light	'			'	1		hanlını
	l i	Becomes stiff, olive green to light gray, with some organics	'		,	1	1		E
	l ∃	1	'			1	1		þ
965.0	5_	1			,	'			E
	l ∃	CAND LOS	1			1			F
	E	0.5" Seam of Clayey SAND, becomes grayish-green	1	}		1			E
-	6	0.5" Seam of medium- to	'			'			E
964.0	6_	coarse-grained sand and fine gravel	1		,	1	1		E
		1		1 111		1			E
	し ヨ	Í	'		,				E
	1 =	4	'	1		1			E
963.0	7.3	j	'	1 []]		'			E
		Becomes brown with trace black	'				Driller no	otes rubble when	E
	l ∃	mottling	.	1 11	. [	1	drilling		E
		0.25" Seam of medium- to	'	1 11	.	1			
962.0	8_	coarse-grained sand	/ '		႕				E
	=	Concrete rubble	'	1 19	1	1			E
	l ∃	l	'	1 19	.1				E
	l ∃	1	'	1 35	.1				E
961.0	_e_	1	'	1 41	d				E
ļ	∃	1	'	1 9	.]				E
		ł	'	l af	1				
	IЭ	1	] '	[4]	d				E
.960.0	10 =	4	,	1 191	1				F
ROJEC	<del></del>		<del></del>	J	<u> </u>	HOLE	NO -		

	1 / 4 4	DRILLING LOG	(CONTINUATION	A SUEE!				Haci	MW39D
OJECT	OFFU	TT FY01 - HF2C PRB PRE-DESIGN	NSPECTOR	<del>- , - , , </del>			·	SHEET	SHEET
	Offutt	AFB, Nebraska	J. Covey					3	OF 5
ELEV.	ОЕРТН	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	[	REMARKS	
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	
960.0	10 —	SAME: Concrete rubble		Pa.		······································	Concrete		—·
		Silty CLAY (CL) - Stiff, grayish-brown,					Peorian L	2200	
	_	moist, low plastic, with trace rust						.0033	
050.0	_,=	staining			]				
959.0	11								
	=	Becomes light brown, with			1				
		fine-grained sand			] ]		[		
		Becomes grayish-brown			{				
958.0	12	Decomes grayish-blown			1		]		
		Sandy SILT (ML) - Medium stiff,					Alluvial S	ilt and Cla	ay
	=	brownish-gray, wet, fine-grained sand.	, [		} i	-	]		-
957.0	13	with trace rust staining							
337.0	"≒								
					<u> </u>	ı			
	=			l //	}				
956.0	14				[				
	$\exists$								
	=	Silty CLAY (CL) - Soft, gray, wet, low	-		1				
955.0	15_	plastic, with trace iron staining			1 1				
	=				]				
	=			<u> </u>					
		Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace iron	<b>:</b>				İ		
954.0	46	staining		===					
934.0	16								
	=								
				===					
	=		_						
953.0	17	SILT (ML) - Medium stiff, gray, wet, low plastic, with Iron staining							
		ow plaste, with from staining	1		}				
	=				1				
		Cille, CAND (CAN)			1		Alluvial S	and	
952.0	18_	Silty SAND (SM) - Dense, reddish-brown, wet, fine-grained			j				
		word more mine-gramed			]				
	=								
951.0	19 =								
9. I.U	'"			🐼		i			
							-		
	∃				1				
	=				•				
950.0	20 -				<u> </u>	146:5:	<u></u>		
ROJEC	'I AEE!	JTT FY01 - HF2C PRB PRE-DESIGN (				HOLE	NO	-MW390	_

HT	RW	DRILLING LOG	(CONTINUATION	I SHEET)				HOLE N	JMBER -MW39D	7	
OJECT	OFFUT	T FY01 - HF2C PRB PRE-DESIGN AFB, Nebraska	INSPECTOR  J. Covey	•				SHEET 4	SHEET OF 5	s	
ELEV.	DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT		REMARK			
(a) 950.0	(b) 20	SAME: Silty SAND (SM) - Dense,	(d)	(e)	(f)	(g)	Aliuvial S	(h) Sand		Ł	ı
	<del></del> =	reddish-brown, wet, fine-grained					,	,		E	
Î	크				}					E	1
	≓				1					E	
949.0	21-금									E	
	=				1					E	
	$\exists$									E	
•	ᆿ				1					E	
948.0	22				1					F	
	=				•					E	-
	∃				]					E	
	_ =					}				F	
947.0	23	Becomes medium dense			3					F	
	╡				3					þ	
	$\exists$	0.5" Seam of fine gravel			1					F	1
	=	Becomes gray	ļ		1	ļ				F	
946.0	24	•	1		3					F	
	. =									F	
	크				1					E	İ
	=				2					F	
945.0	25	•		)						F	
	=									E	
		Becomes SAND with SILT (SP-SM)								-	ł
	Ξ	,			3					E	
944.0	26									F	
	$\exists$									E	1
	=									-	
047.0	=			l 2						E	1
943.0	27.	Silty SAND (SM) - Dense, gray, wet,			Ĵ					E	
	=	fine-grained		l 🔣	§					E	Ì
	=	With some clay								E	
942.0	28_					1				F	
V72.V	""				8					E	1
	] [				Ŋ,					E	
	=				8					E	
941.0	29_	With trace clay			y a					E	
271.0					8		1			E	
	=				3					E	
	=		1		ğ	1				=	
940.0	30 =									E	ļ
ROJEC	T	ITT EVAL LIEGO DOD CON DECISION	0#. 455.33			HOLE	NO	3 4 5 4 10			
	UFFL	JTT FY01 - HF2C PRB PRE-DESIGN	Offutt AFB, Ne	Draska		i	H20	C-MW3	JD U	- 1	L

OJECT	OFFU"	TT FY01 - HF2C PRB PRE-DESIGN	INSPECTOR					l l	HEETS
-	Onut /	AFB, Nebraska	J. Covey	GEOTECH SAMPLE	ANALYTICAL	<u> </u>	Γ	5 OF	5
ELEV.	DEPTH	DESCRIPTION OF MATERIALS	RESULTS	OR CORE BOX NO.	SAMPLE NO.	BLOW COUNT		REMARKS	
(a)	<b>(b</b> )	(c)	(d)	(e)	(0)	<b>(g)</b>		(h)	
940.0	30 🗕	SAME: Silty SAND (SM) - Medium					Alluvial S	Sand	
	l∃	dense, gray, wet, fine-grained	1		1		1		
	∃			120					
	1 3								
939.0	31				}		ļ		
	! 크			🗠	3				
		Clayey GRAVEL (GC) -	1	%-	₹		Glacial C	Outwash	
	=	Grayish-brown, wet, fine gravel,			7				
	l ♯	subrounded to subangular, with some medium- to coarse-grained sand and	9	0	:				
938.0	32_	_cobbles to 2.5"	`.l	ا اقرا	4	1	ļ		
	l ∃	Clayey SAND (SC) - Medium dense,			1		1		
		light gray, wet, medium-grained sand	i. 1		4				
	=	with trace coarse-grained sand and			· <b>!</b>	ŀ			
		fine gravel		1 188		1			
937.0	33	Becomes greenish-gray		撥	4	1			
	=								
	=		1						
	! コ					Ì			
							1		
936.0	34								
	=						1		
	=								
	=								
935.0	35						Dellar	atae bard didili-	
	=	CLAY (CH) Man stiff seconds seconds	<del>.  </del>	<u>                                    </u>	H		Glacial 1	otes hard drilling Fill	ś
		CLAY (CH) - Very stiff, greenish-gray wet, high plastic, with some medium-	<u>'</u> '						
		to coarse-grained sand	/\		1		Bottom (	of Boring @ 35.	5'
004.0	20 =	<u> </u>		1	1				
934.0	36								
	=								
					1				
	=						i		
933.0	37 -					1			
au0.U	"=				1				
	=			1			1		
							1		
	=	`							
932.0	38 =						1		
			1			1			
	=	}							
			l l						
	=	}		1	1	1			
931.0	39_	1			1				
				1	1				
	1 =	1		]	1				
	1 =	1		1	1		1		
	=	1		]			1		
930.0	40 -	1		<u> </u>		1,,2,2	<u> </u>		
ROJE	CT	UTT FY01 - HF2C PRB PRE-DESIGN				HOLE	NO	C-MW39D	

s



)JECT		DRILLING LOG TT FY01 - HF2C PRB PRE-DESIGN	(CONTINUATION	SHEET)				MW40D	
	Offutt	AFB, Nebraska	J. Covey				SHEET 2	SHEET: OF 5	S
LEV.	DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX NO.			T	<u> </u>	┥
(a)	(ь)	(c)	(d)	(e)	SAMPLE NO.	BLOW COUNT (g)	REMARKS (h)		i
970.0	○∃	Asphalt			<u> </u>		Pavement		+
l				i					þ
	=	Silty CLAY (CL) - Stiff, gray, moist,		П	1	5	Fill		F
969.0	13	low plastic, with trace iron staining							þ
	╡			111		8			E
j	三			[]]					Ē
	=			i [ ]		10			þ
968.0	2_					s	R=11/18		E
-	╡		1			4			F
}	$\exists$								
	=					5			þ
967.0	3.	With some organics			-				E
	$\exists$			]][	<u> </u>	9			Ė
	二	December him		[]]					E
	∃	Becomes brown				12			E
966.0	4-7				[	S	R=16/24		F
-	∃				[	9			E
	=	With any mottle and the se							F
	$\exists$	With gray mottling and trace fine gravel	1			9			E
965.0	5∃								F
	∃	Becomes gray and very stiff			<u> </u>	12			E
	$\exists$	and gray und vory our							E
	=					16			F
964.0	6-	Becomes silty, with trace medium to					R=18/24		E
	∃	coarse-grained sand and fine to		111		5			F
	크	medium gravel	İ	[1]		_			E
	_=					8			E
963.0	(글	Concrete rubble	-				R=12/12		E
	∄				[		Refused sampler		E
	극			194					F
962.0	8								E
JUZ.U	°=			19/2			Drilled through rubb	المرافقين مأ	F
	$\equiv$			JA:			sampling	NE WILLOUI	F
	$\exists$			la.		. 1			E
961.0	Εe			145		·			F
	Ĭ			173					E
	∃			19					
	$\exists$								E
960.0	10								F
OJEC	Г			94.		HOLEN	0		F
. =	OFFU'	TT FY01 - HF2C PRB PRE-DESIGN ( I-R, AUG 94	Offutt AFB, Nebr	aska			H2C-MW40D		l

Į	П	KVV	DRILLING LOG	CONTINUATION	N SHEET)				HOLE NUMBER H2C-MW40D
	PROJECT	OFFU	TT FY01 - HF2C PRB PRE-DESIGN	NSPECTOR					SHEET SHEET
ŀ		Onut	AFB, Nebraska	J. Covey	GEOTECH SAMPLE	ANALYTICAL		<del></del>	3 OF 5
	ELEV.	DEPTH	DESCRIPTION OF MATERIALS	RESULTS	OR CORE BOX NO.	SAMPLE NO.	BLOW COUNT	[	REMARKS
ļ	(a)	(b)	(c)	(d)	(e)	(f)	(g)	1	(h)
	960.0	10 =	SAME: Concrete rubble		<sup>q</sup> a	•		Fill	
		=			1 1	7		Driller no	tes end of rubble
,		$\equiv$	Silty SAND (SM) - Medium dense,	┪ !			10	Alluvial S	and
	959.0	│ ,,∃	gray with trace brown, wet,			}		_	
	939.0		fine-grained sand	1			15	}	
						1	10		
								İ	
•		- 3		İ	Geo	2	3	1	
	958.0	12_		ļ		1	S	R=15/18	
-		╛		į i		<u> </u>		No Samp	le: Driller overdrille
		. ≓				1		ļ	
-								İ	
ŀ		=		1	22				
	957.0	13.				1			
-									
1									
-		=				1			
	956.0	14_=				1			
-		=					3	1	
						3			
-		=				3	1	i	
		=	0-1-017 (41)				•		
.	955.0	15	Sandy SILT (ML) - Very soft to soft, gray, wet, low plastic, with fine sand			}		Alluvial S	iilt and Clay
_			Silty CLAY (CL) - Soft, gray, wet, low			1	3		
			plastic, with trace iron staining		<u> </u>	1			
-			,		<u> </u>	-	3		
:	954.0	16_				-	s	R=15/24	
-					<u>                                   </u>	1	1	1	
-					- <del></del>	1 .	3		
:			With trace very fine-grained sand	ļ					
	953.0	17_		•	<u> </u>	_	_		
:		=		i	<u>                                   </u>	_	3	ļ	
			<b>-</b>		<del></del>	<u> </u>			
-	:		Becomes medium plastic		Geo 🗀	∤	4	1	
	952.0	18_				-	S	R=19/24	
-		=				┨	2		
-					L <del>_</del>	┨			
-		_			! <u>L</u> =	1	2		
	6-4-6	<b>1</b>		UC-4 6	<u> </u>	1			
-	951.0	19		HS=1.6			4		
-		=		-		1	•		
-		=	Silty SAND (SM) - Medium dense,	-		3	_		
-			gray, wet, fine-grained sand		Geo	8	8	Alluvial S	
-	950.0	20 -		<u> </u>		<u> </u>	S	R=24/24	
-	PROJEC	7 0551	ITT EV01 - HE20 PPP PPF PF01044 6				HOLE	۷0	
			JTT FY01 - HF2C PRB PRE-DESIGN ( A-R, AUG 94	mutt AFB, Net	гаѕка				-MW40D onent: CECW-E

-EG)

Offutt AFB, Nebraska J. Covey 4 0F 5  EV. DEPTH DESCRIPTION OF MATERIALS FIELD SCREENING RESULTS OR CORE BOX NO. SAMPLE NO. BLOW COUNT REMARKS  (d) (e) (f) (g) (h)	ECT	OFFU	TT FY01 - HF2C PRB PRE-DESIGN	INSPECTOR					SHEET	AW40D SHEET	rs
DESCRIPTION OF INTERNALS   PESSATS (n)   DROCOME ROX NO (n)   DROCOME		Offutt	AFB, Nebraska						4 (		_
Solity CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace medium plastic clay   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, medium plastic clay   Sity CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Sity SAND (SM) - Loose, gray, wet, medium plastic, with trace sand   Sity SAND (SM) - Loose, gray, wet, fine-grained sand   Sity SAND (SM) - Loose, gray, wet, fine-graine	EV.	DEPTH	DESCRIPTION OF MATERIALS		l		BLOW COUNT		PEMARKS		_
SAME: SIMY SAND (SM) - Medium dense, gray, wet, fine-grained sand  49.0 21 Silty CLAY (CH) - Medium stiff, gray, wet, high plastic Silty SAND (SM) - Medium dense, gray, wet, high plastic Silty SAND (SM) - Medium stiff, gray, wet, high plastic, with trace sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM)	)	(b)	(c)	(d)					· <del>-</del>		
dense, gray, wet, fine-grained sand  49.0 21 Silty CLAY (CH) - Medium stiff, gray, wet, high plastic silty SAND (SM) - Loose, gray, wet, fine-grained sand  48.0 22 Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace  10 Silty SAND (SM) - Loose, gray, wet, fine-grained sand  40.0 24 Silty SAND (SM) - Loose, gray, wet, fine-grained sand  50 Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic clay  51 Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand  45.0 25 Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand  46.0 26 Integrained sand  51 Sandy SILT (ML) - Medium stiff, gray, wet, medium plastic, with trace sand  47.0 26 Integrained sand  58 R=24/24  58 R=24/24  49.0 26 Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand  40.0 27 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  40.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  41.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  41.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  41.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  41.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  41.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  41.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  41.0 29 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  42.0 26 The Medium stiff, gray, wet, gray, gray, w	50.0	20 —			120	<del>d ''</del>		Alluvial S:			
49.0 21 Sitly CLAY (CH) - Medium stiff, gray, wet, fine-grained sand Sitly SAND (SM) - Medium stiff, gray, wet, high plastic, with trace sand Sitly SAND (SM) - Loose, gray, wet, fine-grained sand Sitly SAND (SM) - Loose, gray, wet, fine-grained sand Sitly SAND (SM) - Loose, gray, wet, fine-grained Sitly SAND (SM) - Loose, gray, wet, medium plastic clay Sitly SAND (SM) - Loose, gray, wet, medium plastic, with trace sand Sitly SAND (SM) - Loose, gray, wet, fine-grained Sand Sitly SAND (SM) - Loose, gray, wet, fine-grained Sand Sitly SAND (SM) - Loose, gray, wet, fine-grained Sand Sitly SAND (SM) - Loose, gray, wet, fine-grained Sand Sitly SAND (SM) - Loose, gray, wet, fine-grained sand Sit						j	-				
Silty CLAY (CH) - Medium stiff, gray, wet, high plastic   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, medium plastic clay   Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand   Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand   Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand   Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace medium gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (			, o . , ,			8		Added dil	iiiig iiiuu		
Wet, high plastic   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand   Silty CLAY (CL) - Silty, gray, wet, medium plastic, with trace   Silty SAND (SM) - Medium dense, gray, wet, silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CL) - Silty, gray, wet, medium plastic, with trace   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gra					l 🔣	Í	4				
Wet, high plastic   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand   Silty CLAY (CL) - Silty, gray, wet, medium plastic, with trace   Silty SAND (SM) - Medium dense, gray, wet, silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CL) - Silty, gray, wet, medium plastic, with trace   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace graysh-green, moist, low to medium plastic, with trace medium- to coarse-grained sand   Silty CLAY (CL) - Very stiff to hard, gra	اممه	24 =	Silty CLAY (CH) - Medium stiff, gray			# =		Intorbodd	sal Alburia		
Silty CLAY (CH) - Medium stiff, gray, wet, hine-grained sand   Silty CLAY (CH) - Medium stiff, gray, wet, hine-grained sand   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic clay   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic clay   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Medium stiff, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silt	49.0	<b>- ⁴'</b> ⊟	wet high plastic		Geo ==	3		Interpeda	ea Alluviu	m	
gray, wet, fine-grained sand  48.0 22    Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace fine-grained sand fine-grained sand stiff, gray, wet, medium plastic clay silty SAND (SM) - Loose, gray, wet, fine-grained sand silty CLAY (CH) - Medium stiff, gray, wet, medium plastic clay silty CLAY (CH) - Medium stiff, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Loose, gray, wet, fine-grained sand silty SAND (SM) - Medium dense, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand sand silty CLAY (CL) - Sitf, gray, wet, fine-grained sand silty CLAY (CL) - Sitf, gray, wet, silty CLAY (CL) - Sitf, gray, wet, silty CLAY (CL) - Sitf, gray, wet, silty CLAY (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sitf, gray, wet, silty clay (CL) - Sit		_	<del></del>	· <b></b>		7	8				
Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace fine-grained sand slity SAND (SM) - Loose, gray, wet, fine-grained sand slity SAND (SM		_	aray wet fine-arained sand								
Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace Silty SAND (SM) - Loose, gray, wet, fine-grained  Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic  Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic clay Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand  Sandy SILT (ML) - Medium stiff, gray, wet, medium plastic, with trace sand  Sandy SILT (ML) - Medium stiff, gray, wet, fine-grained sand Silty CLAY (CH) - Silfr, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, medium plastic, with trace sand  4.  Sandy SILT (ML) - Medium stiff, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, medium plastic Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty CLAY (CL) - Silfr, gray, wet, medium plastic Silty CLAY (CL) - Silfr, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty S			S Branca cara		Geo 🐼	8	8				
Silty CLAY (CH) - Medium stiff, gray, wet, high plastic, with trace sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Sandy Silt (ML) - Medium stiff, gray, wet, fine-grained sand  Sandy Silt (ML) - Medium stiff, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Sandy Silt (ML) - Medium stiff, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Sandy Silt (ML) - Medium stiff, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Sandy Silt (CLAY (CL) - Stiff, gray, wet, medium plastic  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, geo  Silty SAND (SM) - Loose, gray, wet, gray, wet, gray, wet, geo  Silty SAND (SM) - Loose, gray, wet, gray, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, gray, wet, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, gray, gra						3	ç	R=16/24			
wet, high plastic, with trace fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained  Silty SAND (SM) - Loose, gray, wet, fine-grained  Silty SAND (SM) - Loose, gray, wet, fine-grained  45.0 24 Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand  45.0 25 Silty CLAY (CH) - Medium stiff, gray, wet, fine-grained sand  Silty SAND (SM) - Loose, gray, wet, fine-grained sand  Silty SAND (SM) - Hoedium dense, gray, wet, fine-grained sand  Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  47.0 28 Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  Silty SAND (SM) - Medium	48.0	22	Silby CLAY (CLI) Modium stiff			9		10/24			
1   1   2   2   3   3   3   3   3   4   4   5   6   6   6   6   6   6   7   7   7   7	ļ		wet high plactic with trace			1	6				
1   1   2   2     3   3   3   3   3   3   3			\fine_arained sand	٦ ا		<b>,</b>					
### Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic #### Silty SAND (SM) - Loose, gray, wet, fine-grained #### fine-grained #### Sandy SiLT (ML) - Medium stiff, gray, wet, medium plastic, with trace sand ##### Sandy SiLT (ML) - Medium stiff, gray, wet, fine-grained sand ### Silty SAND (SM) - Loose, gray, wet, fine-grained sand ### Silty SAND (SM) - Loose, gray, wet, fine-grained sand ### Silty SAND (SM) - Loose, gray, wet, fine-grained sand ### Silty SAND (SM) - Loose, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand ### Silty SAND (SM) - Medium dense, gr	į	7	Silty SAND (SM) - Loose gray wet	<b>~</b>		7	1				
Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic clay   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty CLAY (CL) - Silf, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, medium plastic   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CL) - Silf, gray, wet, medium plastic   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium plastic place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place   Silty Sand Place		▏▁╡	fine-grained			3	·				
Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic  46.0 24 Silty SAND (SM) - Loose, gray, wet, fine-grained  1" Seam of medium plastic clay Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand  45.0 25 Sandy StLT (ML) - Medium stiff, gray, wet, medium plastic, with trace gray, wet, fine-grained sand  44.0 26 Ine-grained sand Silty SAND (SM) - Loose, gray, wet, medium plastic Silty CLAY (CL) - Stliff, gray, wet, medium plastic Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  43.0 27 With trace medium gravel  44.0 28 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium- to coarse-grained sand  45.0 27 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium- to coarse-grained sand  46.0 30 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium- to coarse-grained sand  47 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium- to coarse-grained sand  48 Security Allows Silty SAND (SM) - Loose, gray, wet, medium- to coarse-grained sand  49 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium- to coarse-grained sand  49 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium- to coarse-grained sand	47.0	23	<b>6</b>			· /					
wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty SAND (SM) - Loose, gray, wet, medium plastic clay   Sandy SiLT (ML) - Medium stiff, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, medium plastic   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Sulting Sand   Silty SAND (SM) - Sulting Sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Si		=					2				
wet, medium plastic   Silty SAND (SM) - Loose, gray, wet, fine-grained   Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand   Silty SAND (SM) - Loose, gray, wet, medium plastic clay   Sandy SiLT (ML) - Medium stiff, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Silty SAND (SM) - Loose, gray, wet, medium plastic   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand   Silty SAND (SM) - Sulting Sand   Silty SAND (SM) - Sulting Sand   Silty SAND (SM) - Loose, gray, wet, fine-grained sand   Si			Silty CLAY (CH) - Medium stiff, gray	· <b>-</b>	==:	<u> </u>					
46.0 24 Silty SAND (SM) - Loose, gray, wet, fine-grained  1* Seam of medium plastic clay Silty CLAY (CH) - Medium stiff, gray, wet, medium plastic, with trace sand  45.0 25 Sandy SILT (ML) - Medium stiff, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty SAND (SM) - Loose, gray, wet, fine-grained sand Silty CLAY (CL) - Stiff, gray, wet, medium plastic Silty SAND (SM) - Medium dense, gray, wet, fine-grained sand  42.0 28 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium-to coarse-grained sand  41.0 29 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium-to coarse-grained sand  42.0 30 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium-to coarse-grained sand  43.0 31 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium-to coarse-grained sand  44.0 32 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium-to coarse-grained sand  45.0 30 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium plastic, with trace medium-to coarse-grained sand  46.0 30 Silty CLAY (CL) - Very stiff to hard, gray with trace grayish-green, moist, low to medium-to coarse-grained sand  47.0 Silty SAND (SM) - Loose, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, wet, gray, gray, wet, gray, wet, gray, wet, gray, gray, wet, gray, wet, gray, wet, gray, wet, gray, gray, wet, gray, gray, wet, gray, wet, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, wet, gray, gray, gray, gray, gray, gray, wet, gray,			wet, medium plastic		<del></del>		4				
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	JUEU		ITT EV01 HESC BOD DOT DECICE	<b>^∉</b> ∧⊏₽ ▲! !			HOLE				

HTRW DRILLING LOG (CONTINUATION SHEET)								HOLE NUMBER H2C-MW40E	כ
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ELEV.	DEPTH		FIELD SCREENING			l		5 OF 5	_
(a)	(b)	DESCRIPTION OF MATERIALS (c)	RESULTS	OR CORE BOX NO.	SAMPLE NO.			REMARKS	
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	i <sup>™</sup> ⊐	hard, gray with trace gravish-green		NO N	<b>7</b>		Glacial Til		
l	=	moist, low to medium plastic, with			7 5				
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	<u> </u>	TT FY01 - HF2C PRB PRE-DESIGN ( A-R, AUG 94	JIIUII AFB, Neb	гаѕка			H2C-l	AW40D	



# **APPENDIX B**

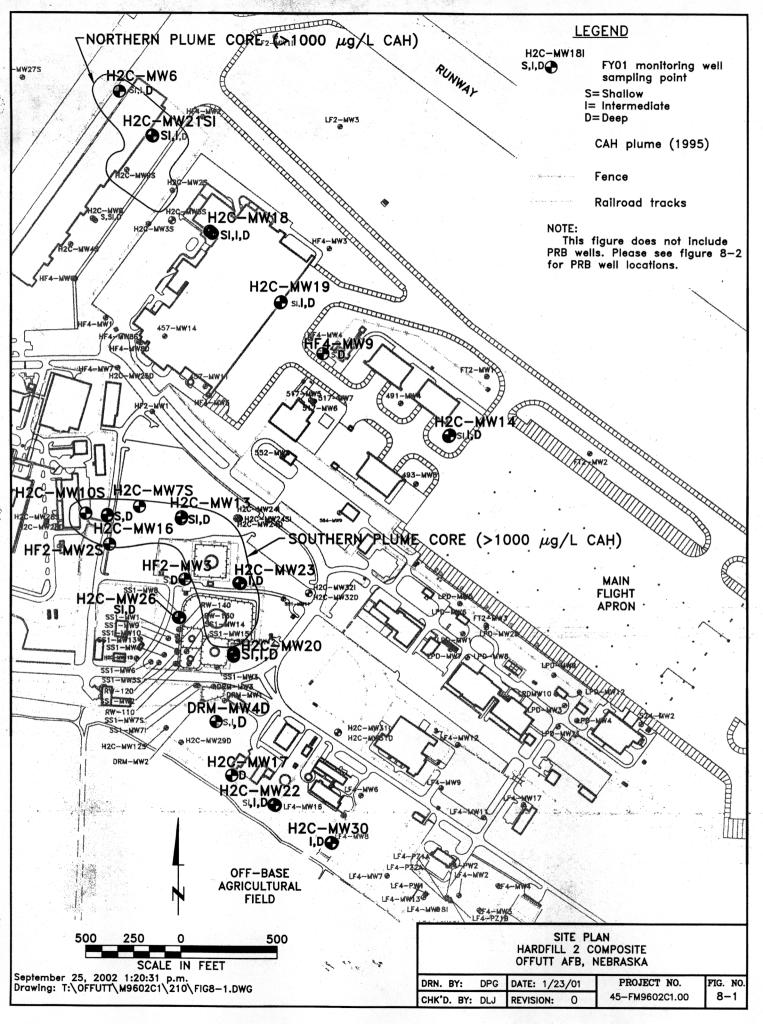
# **SITE PLANS AND PLUME INFORMATION**

Fig 8-1	SITE PLAN HARDFILL 2 COMPOSITE, OFFUTT AFB, NEBRASKA
Fig 8-13	SOUTHERN PLUM TOTAL CAH ISOCONCENTRATION MAP

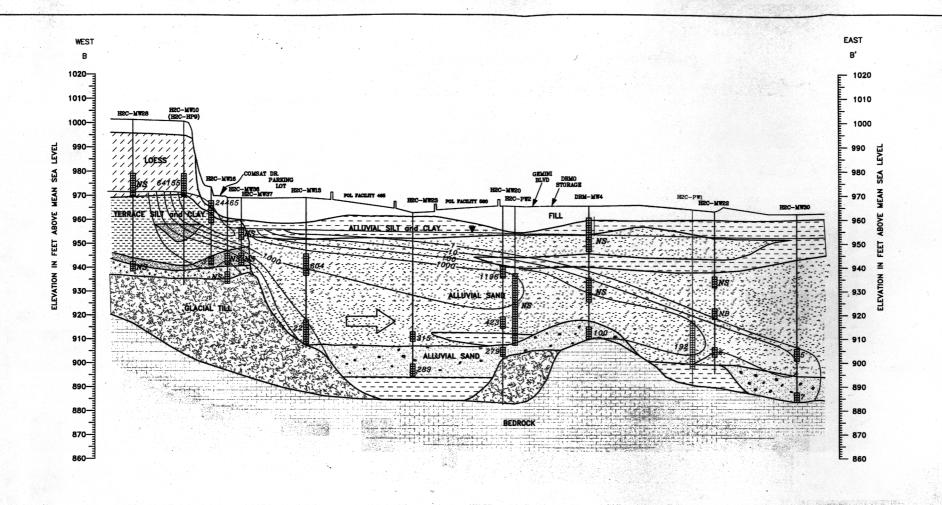
Fig 2-4 GEOLOGIC CROSS-SECTIONS & TOTAL CAH ISOCONCONCENTRATIONS HF2 COMP. SITE

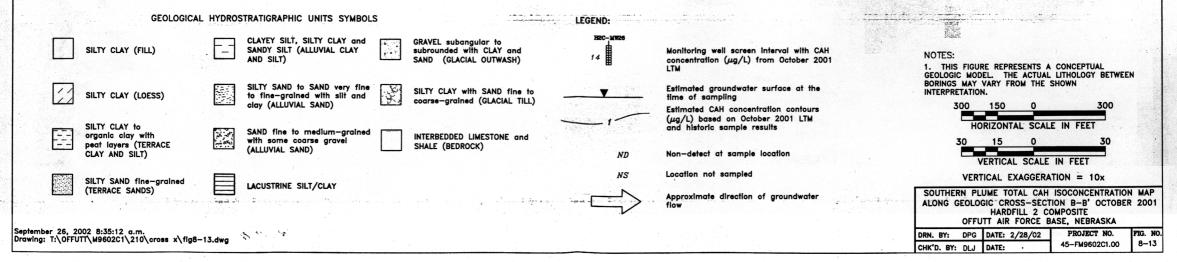
Fig 1 SITE PLAN FIRE TRAINING AREA 2 (Near Apron)
HGS HISTORICAL GROUNDWATER SAMPLING



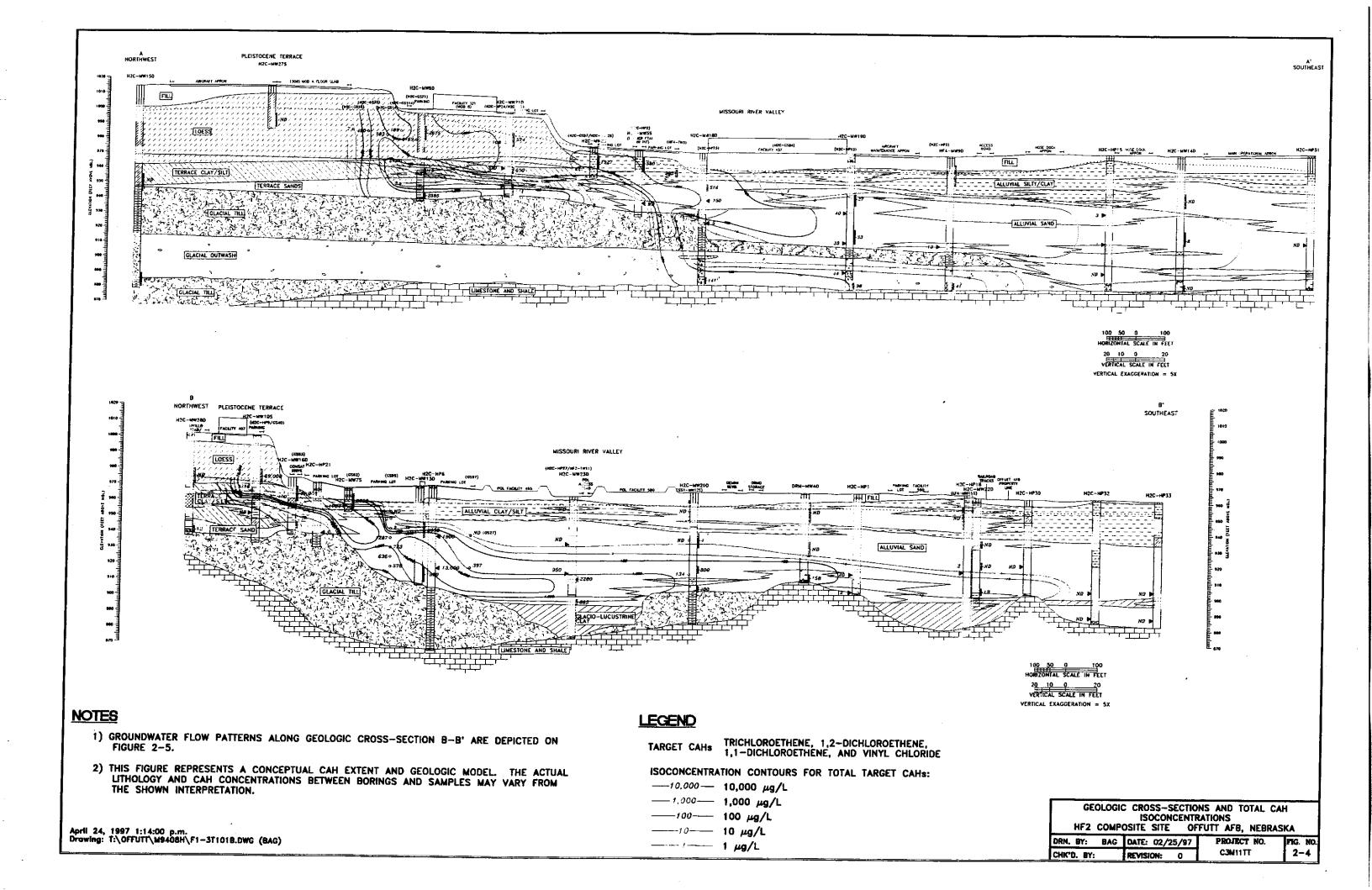




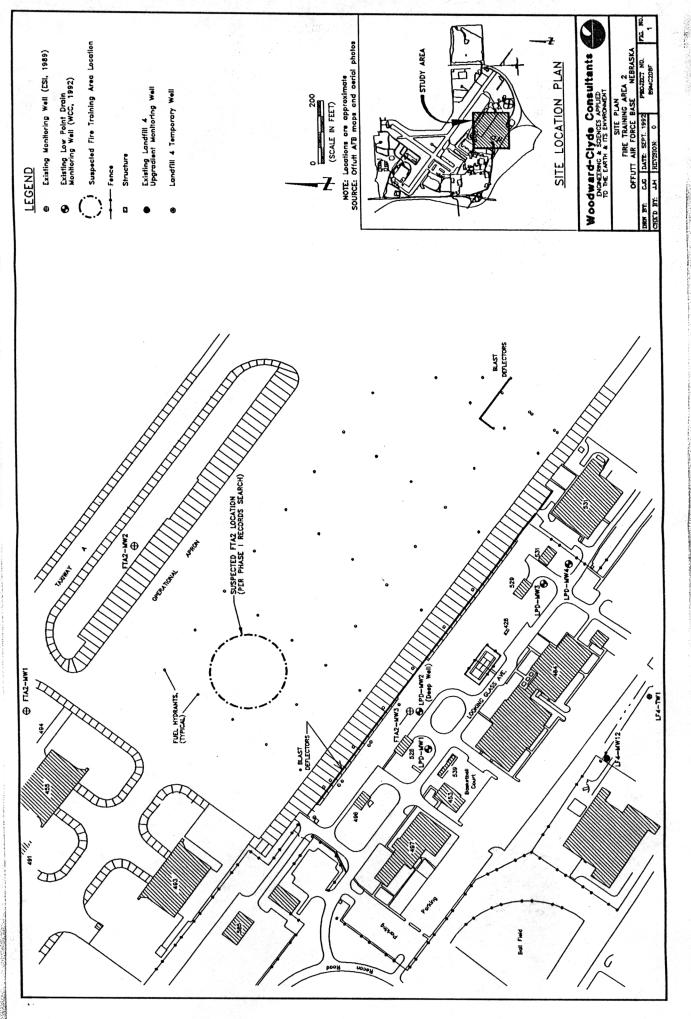














# HISTORICAL GROUNDWATER SAMPLING

	Sampling	Top of Bottom	Bottom of						Analytical	Analytical   Extraction
Well	Date		Screen	Contaminant	Value	MCL	UNITS	UNITS MATRIX Method	Method	Method
LPD-MW6	30-Nov-95	7.4	1	6.9 1,2-DICHLOROETHANE	6	2	2 UG/L	GW	SW8240	SW5030
LPD-MW6	30-Nov-95	7.4	_	6.9 TOTAL 1,2-DICHLOROETHENE	30	5	5 UG/L	GW	SW8240	SW5030
LPD-MW10	01-Dec-95	6.9	_	6.4 TOTAL 1,2-DICHLOROETHENE	36	5	5 UG/L	GW	SW8240	SW5030
LPD-MW1	01-Dec-95	9		15 BENZENE	52	5	5 UG/L	GW	SW8240	SW5030
LPD-MW6	30-Nov-95	7.4	_	6.9 BENZENE	420	5	5 UG/L	GW	SW8240	SW5030
LPD-MW10	01-Dec-95	6.9	_	6.4 BENZENE	_	5	5 UG/L	GW	SW8240	SW5030
LPD-MW8	30-Nov-95	7.4	_	6.9 PETROLEUM HYDROCARBONS	9.0	_	1 MG/L	GW	E418.1	M3510
LPD-MW5	30-Nov-95	7.4	_	6.9 PETROLEUM HYDROCARBONS	9.0	_	1 MG/L	GW	E418.1	M3510
LPD-MW10	01-Dec-95	6.9		6.4 PETROLEUM HYDROCARBONS	0.7	_	MG/L	GW	E418.1	M3510
FT2-MW3	30-Nov-95	5.5	2	0.5 PETROLEUM HYDROCARBONS	0.8	_	MG/L	GW	E418.1	M3510
LPD-MW6	30-Nov-95	7.4		6.9 PETROLEUM HYDROCARBONS	0.0	~	MG/L	GW	E418.1	M3510
LPD-MW1	01-Dec-95	9		15 PETROLEUM HYDROCARBONS	110	_	MG/L	GW	E418.1	M3510
LPD-MW10	01-Dec-95	6.9	_	6.4 TRICHLOROETHYLENE (TCE)	2	2	5 UG/L	GW	SW8240	SW5030



### **APPENDIX C**

# FINAL REPORT CONTAMINATION INVESTIGATION

# HYDRANT FUEL SYSTEM OFFUTT AIR FORCE BASE

**BELLEVUE, NEBRASKA** 



Prepared by

# U.S. ARMY CORPS OF ENGINEERS OMAHA DISTRICT

**November 2003** 

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### **Contamination Investigation Report**

Sub-Surface Soil Sampling in the Vicinity of Proposed Hydrant Fuel System Offutt Air Force Base, Bellevue, Nebraska

### 1.0 BACKGROUND

Design work for the new hydrant fuel system at Offutt AFB is being performed by the Omaha District, US Army Corps of Engineers (USACE). As part of the design effort, Omaha District was tasked with environmental sampling and analysis of soils in the vicinity of the proposed new fueling system to determine if contamination is present in sufficient quantities that would significantly impact the construction of the project.

Several documented contaminant releases to the environment have occurred at Offutt AFB as a result of landfill use, discharges to wastewater systems, fire training activities, and accidental spills and leaks. Subsurface plumes containing fuels and solvents such as trichloroethylene are known to exist in the area groundwater.

### 1.1 Objective

The objective of this site investigation was to determine if suspected petroleum hydrocarbon and VOC contamination exists in sub-surface soils underlying the proposed project boundaries (see Appendix A), which may necessitate special soil excavating (for worker health and safety) and handling/disposal procedures and conditions that will be required during construction.

### 1.2 Investigation Location

The field investigation described in this report was conducted along the alignment of the new hydrant fuel system. Refer to Appendix A for a site map.

### 2.0 FIELD INVESTIGATION SUMMARY

An Omaha District drill crew conducted the contamination investigation for the Hydrant Fuel System at Offutt AFB on 15 to 20 October 2003. The investigation originally consisted of 18 direct push soil sampling borings, numbered sequentially OF03DP01 through OF03DP18. However, location OF03DP04 was not sampled due to the presence of a parked aircraft for the duration of the field effort.

Sub-surface soil samples were collected for headspace screening and laboratory analysis using a SIMCO EARTHPROBE<sup>TM</sup> 200 direct push rig equipped with 2-inch nominal diameter outer rods and a 1-inch diameter by 2-foot long steel split spoon sampler.

Eighteen (18) environmental sampling locations were selected for placement over the project site based on the planned layout of the hydrant fuel system. These borehole locations were marked in the field using spray paint to assist in underground utility location work. An Offutt AFB digging permit was obtained prior to conducting fieldwork.

Collected soil samples have been analyzed for gasoline, diesel, and VOCs using the following laboratory methods: TPH-DRO (8015B) and VOC-GRO (8260B). The samples were analyzed by the USACE Environmental Chemistry Branch Laboratory in Omaha, NE.

### 3.0 DESCRIPTION OF INVESTIGATION

### 3.1 Concrete Coring

Pavement coring was performed using a Milwaukee, 20-amp, rotary drill equipped with 2-inch nominal diameter diamond core barrel. The pavement was patched using a high strength (5,000 psi) concrete mix.

### 3.2 Direct Push Sampling Procedures

The soil sampling for this investigation was performed by advancing the direct push outer rods to pre-determined sample depths, removing the center drive point, inserting the split-spoon sampler inside the outer rods, and driving the spoon ahead of the outer rods to collect the sample. A portion of the sample was used for headspace screening (paragraph 3.4). The remainder was prepared for lab analysis, when applicable (paragraph 3.3).

### 3.3 Environmental Soil Sampling

Prior to collecting samples, the split-spoon samplers were cleaned to eliminate any possible cross contamination as described in Section 3.7 -"Decontamination". Soil samples were acquired from 17 test holes. Sample intervals for environmental soil analysis at each borehole were originally planned at 5, 10, and 15 feet below pavement surface (or ground surface), with the stipulation that the deepest sample be adjusted if the groundwater occurred shallower than 15 feet so that the sample is collected above groundwater. Unexpected shallow groundwater, primarily under the apron, necessitated field changes to the original sampling plan. The original sampling plan specified samples be collected from 5, 10, and 15 feet for headspace screening. Additionally, soil samples for laboratory chemical analyses were to be collected from the 10 and 15-foot intervals. The 15-foot sample was to be submitted for lab analyses only if the headspace PID measurement was higher than the 10-foot sample. Each soil sample consists of 3 Encore® samplers for VOC/GRO and one 4-ounce jar for percent solids and DRO analyses. Groundwater was encountered between approximately 6.5 and 7.5 in all the borings under the apron. As a result, using the criteria to collect the samples above ground water, no samples from any of the borings under the apron were submitted to the laboratory for chemical analyses. Additionally, with the exception of the first hole sampled (DP03) the 15-foot samples were not even attempted due to the saturated conditions and heaving sands. The borings located off of the apron (DP12 through DP18) encountered subsurface conditions close to what was expected enabling the sampling to be conducted essentially in accordance with the original sampling plan.

After the split-spoon sampler was retrieved, it was opened and immediately scanned by sight, smell, and with a PID for signs of possible fuel contamination.

After PID scanning, the environmental samples for VOC analysis were immediately captured in three five-gram Encore<sup>®</sup> sample cups, capped securely, then placed into sealable foil pouches for storage in iced shipping coolers. The remainder of the recovered soil in the opened split-spoon

was then placed into a 4-ounce jar for the remaining analyses and/or a baggie for headspace screening.

The Chemical Quality Assurance Report for the soil analyses may be found in Appendix D. Assumptions for using soil data to determine quantities of contaminated soil may also be found in this Appendix.

### 3.4 Headspace Screening Procedures

The soil samples were screened for volatile organic compounds in the field at the time of sample collection. Field screening was performed using a Photovac 2020 photo-ionization detector (PID). The field screening was performed in accordance with the following procedures.

- Immediately upon opening the split-spoon and after collecting the Encore sample (when required), a representative portion of the sample was collected and placed in a new, clean, plastic sandwich bag placed inside a jar. Readings were periodically taken inside empty bags to ensure no external contamination was being introduced.
- The jar was then sealed with at least one continuous sheet of aluminum foil, using the jar lid to secure the foil.
- The jar was then vigorously agitated for at least fifteen seconds and then allowed a minimum of ten minutes for the sample to adequately volatilize.
- After re-shaking the jar, the lid was removed and the vapor sampling probe was quickly inserted through the aluminum foil. The maximum meter response (within first two to five seconds) was recorded.
- The headspace screening data was recorded on the Sample Description Log.
- The screening instrument was calibrated using 100 ppm isobutylene span gas at the start of each workday and periodically throughout the day as determined appropriate by the geologist in the field.

### 3.5 Site Conditions

### 3.5.1 Significant Environmental Observations

Sample Identification Numbers and depths, date sampled, and headspace results are shown on Table 1. The sampled borehole locations are shown in Appendix A. Sample Description Logs are included in Appendix C. Chain of custody information can be viewed in Appendix B. The sample numbers consist of the boring number followed by the depth. For example: the 8 to 10-foot deep sample from boring OF03DP12 is OF03DP12-08. The 4 to 6-foot sample is OF03DP12-04.

**TABLE 1 - Environmental Sampling Information** 

Sample ID.	Date	Headspace Results	Lab*
	10/1=/02	(ppm)	
OF03DP01-04	10/17/03	1.2	
OF03DP01-06	10/17/03	0.0	
OF03DP01-08	10/17/03	0.0	
OF03DP02-04	10/17/03	0.1	
OF03DP02-06	10/17/03	0.0	
OF03DP02-08	10/17/03	0.0	
OF03DP03-05	10/15/03	0.7	
OF03DP03-10	10/15/03	0.0	
OF03DP03-15	10/15/03	0.0	
OF03DP05-02	10/20/03	3.1	
OF03DP05-04	10/20/03	0.0	
OF03DP05-06	10/20/03	0.0	
OF03DP06-04	10/16/03	0.0	
OF03DP06-06	10/16/03	0.0	
OF03DP07-04	10/20/03	0.0	
OF03DP07-08	10/20/03	0.0	
OF03DP08-04	10/16/03	0.0	
OF03DP08-08	10/16/03	No Sample	
OF03DP09-02	10/20/03	0.0	
OF03DP09-04	10/20/03	0.0	
OF03DP10-02	10/20/03	0.0	
OF03DP10-04	10/20/03	0.0	
OF03DP10-06	10/20/03	0.0	
OF03DP11-04	10/21/03	0.0	
OF03DP11-06	10/21/03	0.0	
OF03DP11-08	10/21/03	0.0	
OF03DP12-04	10/21/03	0.0	
OF03DP12-06	10/21/03	0.0	
OF03DP12-08	10/21/03	0.0	X
OF03DP13-04	10/17/03	0.0	
OF03DP13-08	10/17/03	0.0	
OF03DP13-12	10/17/03	0.0	
OF03DP14-04	10/17/03	0.0	
OF03DP14-08	10/17/03	0.0	X
OF03DP14-12	10/17/03	0.0	
OF03DP15-04	10/16/03	0.0	
OF03DP15-08	10/16/03	0.0	X
OF03DP15-14	10/16/03	0.0	
OF03DP16-04	10/21/03	0.0	

Sample ID.	Date	Headspace Results (ppm)	Lab*
OF03DP16-08	10/21/03	0.0	X
OF03DP16-12	10/21/03	0.0	
OF03DP17-04	10/21/03	1,872	
OF03DP17-08	10/21/03	4.4	X
OF03DP17-12	10/21/03	0.0	
OF03DP18-05	10/16/03	0.9	
OF03DP18-10	10/16/03	0.0	X
OF03DP18-15	10/16/03	0.0	

• "X" indicates sample was submitted to laboratory for chemical analyses.

As can be seen from the table above, with the exception OF03DP17, all headspace measurements were zero or very low. The headspace screening results suggests there is no widespread contamination under the apron or the project area in general. The high headspace reading in OF03DP17 was measured in a sand seam at approximately 5.2 to 5.8 feet bgs. A strong odor was also reported. These findings suggest that there may be significant contamination in the vicinity of this boring, which is located near pump house 529.

A total of six (6) samples were sent to the lab for chemical analyses. There were two relatively low detections of TPH/DRO and one low detection of Benzene. The results of the lab testing are presented in Appendix D. The lab results further suggest that significant contamination appears to be somewhat localized and does not appear to be widespread in the project area.

### 3.5.2 Site Geology

The material underlying the apron pavement consists primarily of fine-grained sand. The material appears to be the hydraulic fill that was reportedly placed in this area of the Base in the 1950s. Heaving sand conditions were often reported below the water table. Heaving sand during drilling and sampling often indicate that unstable excavations below ground water can be anticipated. The material west/southwest of the apron appears to consist of interbedded sands (SP) and clays (CL) and may be representative of the natural soils in the area. Refer to the Sample Description Logs in Appendix C for more detailed descriptions of the subsurface materials encountered during this investigation.

### 3.5.3 Ground Water

Ground water was reported in all of the borings. The borings under the apron encountered ground water at approximately 6.5 to 7.5 feet bgs. This was considerably shallower than was anticipated. Prior to this investigation, ground water under the apron was assumed to be 12 feet bgs or deeper. The estimated depth was based on water levels in monitoring wells in the vicinity of the apron, but not in the apron. Ground water levels reported in the borings off the apron ranged between 10 and 14 feet bgs and are close to what was expected. It is possible that the deeper water levels off the apron may be more representative of the natural soils in the area and the higher water levels under the apron represent "perched" conditions in the hydraulic fill.

It should be noted that ground-water levels can only be approximated when using a direct push rig. As a result, the levels reported herein should be considered approximate. Accurate levels would require the installation of piezometers or observations wells.

### 3.6 Air Monitoring

Air monitoring was conducted periodically for worker health and safety. A PID was used each day to measure total organic vapors near the breathing zone, emanating from each open borehole. The PID was calibrated with 100 parts per million (PPM) isobutylene at the start of each work day and periodically during the day. No significant organic vapors presenting a health and safety concern were reported over any borehole during this field investigation.

### 3.7 Decontamination

The drive rods were decontaminated prior to drilling and between each boring by high-pressure hot water cleaning. The split-spoon sampler was hand washed using a liquinox and water solution, tap water rinse, and a distilled water final rinse between each sample depth and sample borehole.

### 3.8 Investigation Derived Waste Management and Borehole Closure

The use of a direct push rig essentially eliminated the generation of cuttings and the only IDW produced were the soil samples that were not sent to the lab. Since essentially no contaminated soil was detected by the headspace screening methods the samples were placed in a bucket and disposed of in a dumpster at the USACE, Omaha Core Drill Facility. The borings were backfilled with Enviroplug (bentonite) and water.

### 4.0 PACKAGING AND SHIPMENT

Following proper collection and labeling, the sample jars were placed in plastic bubble wrap, sealed in plastic baggies, and placed on ice in a cooler. The Encore Samples were placed in their foil packets, sealed in baggies, and placed on ice in a cooler. Each cooler was filled with double-bagged cubed ice to cool the samples to 4 degrees centigrade. The completed chain of custody (COC) form was placed in a Ziploc bag and taped to the inside of each cooler lid. Custody seals were numbered, dated, signed, and affixed to the outside of each cooler. The seals were placed across the lid opening so that the coolers could not be opened without breaking the seals. Finally, the coolers were sealed with fiber strapping tape. The coolers were delivered to the Environmental Chemistry Branch Lab at 420 S. 18<sup>th</sup> Street, Omaha, NE at the end of each workday.

### 5.0 PROTECTION LEVEL

Soil sampling was conducted under worker protection level D. Protection Level D consisted of appropriate fieldwork clothing, hardhat, earplugs, eye protection, Nitrile gloves, and steel toed leather boots.

### APPENDIX A

Quantities Estimate & Sampling Location Map



### Appendix A: Quantities Estimate and Sampling Location Map Sub-Surface Soil Sampling in the Vicinity of Proposed Hydrant Fuel System Offutt Air Force Base, Bellevue, Nebraska

### 1.0 APPROACH AND ASSUMPTIONS

### 1.1 Approach

The objective of this section is to assess the potential for petroleum hydrocarbon and VOC contamination in sub-surface soils underlying the proposed project features, and to estimate the quantities of soil that may require special excavating and handling/disposal procedures during construction. Determining the extent of contaminated areas beyond the specific project excavations was not included in the scope of the investigation.

The potential for contaminated soil was determined using existing data from previous environmental investigations as well as that obtained during this investigation. Volume estimates were calculated from assumptions relating to that potential and generalized geometry of anticipated excavations. These represent conservative figures. Limitations of the investigation necessitated in some cases the use of best guess estimates regarding the potential for contamination.

An existing hydrant fueling system consisting of at least eight lateral fuel pipes and associated fuel pits is present under the apron. Leaks from these lateral lines present the greatest potential for subsurface contamination, thus the points where they intersect the new fuel line loop were targeted for investigation. The scope of the investigation did not allow sampling at every intersection, and parked aircraft further restricted the number and location of sample points. Additional points were located along the proposed transfer pipe route from the new pump house to the truck fueling stand and apron, as these areas are known to have contamination at depth. Borings were also made near the underground storage tanks adjacent to existing pump houses 528 and 529 since their removal is an option in the project.

### 1.2 Assumptions

For these calculations it is assumed that the fuel lines under the apron and other pavement will be installed by shoring the trench sides vertically prior to excavation. Due to the high water table under the apron, and the presence of fine-grained, hydraulically-placed heaving sand in the subsurface, it is improbable that un-shored excavations with a depth of 9 feet, a bottom width of 6 feet and a top width of not more than one 25 foot pavement slab (yielding an approximately a 1 horizontal to 1 vertical slope) will remain stable. Vertically shored trenches will have approximately 9-foot high walls and a 6-foot wide base. Subtracting the top foot of material as pavement, a cross-sectional soil area of 48 square feet, or 5.33 square yards results.

Hydrocarbons released from existing fuel lines would most likely be present from the elevation of the line upward to at least the top of the water column and possibly higher if water levels have fluctuated. For the purposes of this project it is assumed that the full depth of the trench will be contaminated if there has been a release. Contaminated soils under pavement may be returned to the excavation if the pavement is being replaced as long as it is otherwise suitable for use as subgrade. Soil saturated with fuel could not be made suitable, however indications are that this is not the case. Water-saturated soil would be unsuitable for use as subgrade unless it is dried by blending with other materials or allowed to air dry. Dewatering of the excavation to an elevation two feet below the working level is specified to occur prior to reaching that level; therefore the material should be in an unsaturated state and mainly useable if blended with drier subgrade.

The underground fuel tanks excavations at pump houses 528 and 529 are assumed to consist of walls sloped at 1 horizontal to1 vertical, with a bottom footprint 85 feet in length and 45 feet in width, with a total depth of 15 feet (1-foot below the base of the tanks). Note that this depth is anticipated to be below the reported ground water elevation. Ground water contamination plumes have been documented extending south of both buildings, and a PID reading and physical description of soil at a depth of 5 feet west of the tanks at building 529 during this investigation indicate that hydrocarbons may be present above the ground water elevation as well. With these data in mind it is assumed that a majority of the overburden above the tanks is clean, but that from the midpoint of the tank to the base of the excavation contaminated soil will be encountered.

New above ground storage tanks will require excavation to a depth of 5 feet below existing grade for installation of steel H-pile foundations. These excavations are assumed to extend a distance of 5 feet beyond the tank perimeter for a diameter of 60 feet. Because of the potential for past releases from the existing tanks in the area, it is assumed that this soil will contain hydrocarbons.

The new pump house is sited on what is currently an asphalt parking lot reportedly underlain by rubble fill. The excavation for removal of the rubble and placement of structural fill will extend a distance of five feet beyond the building footprint to a depth of 6.5 feet as indicated in the geotechnical report.

### 2.0 AREAS OF POTENTIAL CONTAMINATED SOIL

This investigation discovered little indication of contamination under the apron at the sample locations. Additional information was obtained from TRACER data conducted on the existing fuel lines. This data was generated from collection of vapor in the soil surrounding the fuel lines, and gives an indication of the potential for volatile hydrocarbon contamination. A reading of 100 milligrams per liter (mg/l) is generally considered the threshold of concern. Only one location where the new fuel line is situated recorded a concentration above the threshold; between pits B-4 and B-5 a reading of 115 mg/l was reported. Parked aircraft prevented advancing a boring near this location, however boring OF03DP01 was located approximately

160 away and did not encounter contamination. TRACER data is not available for the adjacent lateral line on the opposite side, however at a distance of approximately 320 feet the concentrations were negligible (see Sampling Location Map for locations of TRACER data). The conservative approach is to assume that the elevated TRACER reading indicates a reasonable potential for contamination. A common method is to assume contamination extends from the known point halfway to an adjacent clean point. In this case, points of no reported contamination exist 160 feet away on one side and 320 feet on the other. Thus the maximum probable length of contaminated pipe run is 250 feet. No other indications of contaminated soil under the apron were encountered, however the spacing of sampling points was necessarily large and small pockets of hydrocarbons could be present between points. An additional length of 100 lineal feet is assumed to account for this uncertainty.

The soil and ground water around the pump houses is documented as contaminated based on previous investigations involving monitoring wells. Hydrocarbon plumes extend from the tanks in a southeasterly direction. Sampling between the tanks was not possible owing to the risk of penetrating them, however a boring was made generally up-gradient of the tanks (see Contamination Investigation Plan for boring locations). Boring OF03DP16 near building 528 did not encounter contamination based on field and lab analysis. Boring OF03DP17 near building 529 was reported to have an elevated PID reading and fuel odor at approximately 5 feet depth.

Boring OF03DP18 was advanced in the vicinity of the new pump house and hydrocarbons were reported by the lab at 32 milligrams per kilogram (mg/kg) at a depth of approximately 10 feet below the surface. Ground water levels away from the apron appear to be considerably lower, approximately 12 to 13 feet below the surface compared to 6 to 7 feet below the top of pavement under the apron. The reported concentration is below the commonly used action level of 100 parts per million (ppm), thus special disposal methods would not be necessary if these levels are representative of the site as a whole. Hydrocarbons were detected at the sample location; therefore it is prudent to assume that some portion of the excavated soil will be above the mentioned threshold. A modest volume is included in the estimate. The geotechnical report for the project specifies that rubble be over excavated and clean structural fill used as backfill, thus the remaining volume must be disposed of regardless.

Boring OF03DP15, located approximately 200 feet northeast of the pump house site and along the transfer line to the truck fill station, encountered hydrocarbons at 54 mg/kg at a depth of approximately 8 feet. Based on an action level of 100 ppm, this concentration is below the threshold where special disposal methods would be necessary. Rubble fill unsuitable for use as pipe backfill may be encountered however. Because hydrocarbons were detected a modest volume of contaminated soil for disposal is included in the estimate.

### 3.0 ESTIMATED QUANTITIES OF CONTAMINATED SOIL

### 3.1 Apron

With a cross-sectional area of 5.33 square yards (48 square feet), and an estimated total length of trench in contaminated areas of 117 yards (350 feet) a total of **620 cubic yards** of contaminated soil is estimated. The majority of this material is anticipated to be reusable as backfill in the trench.

### 3.2 Pump House UST Removal (option)

The base of the excavation for each set of three tanks will be approximately 45 feet in width and 85 feet in length, with sloped sides to a depth of 15 feet (1-foot below the base of the tanks). The total volume of excavation (clean and contaminated soil) is approximately 3540 cubic yards per pump house. Using the assumptions outlined above, the estimated volume of contaminated soil at each pump house is **750 cubic yards**. This volume of material cannot be reused, however the remaining 2790 cubic yards of clean soil may be returned as backfill.

### 3.3 Existing Above Ground Storage Tanks

Two tanks of approximately 50 feet in diameter, with an excavation to 5 feet beyond the perimeter and to a depth of 5 feet will produce approximately **1050 cubic yards** of material.

### 3.4 New Pump House

As stated in the assumptions for the pump house site, reported hydrocarbon levels were below the assumed threshold. In the interest of a conservative estimate, a volume of material equal to five percent of the total excavation is included. The total excavation volume is approximately 1800 cubic yards, therefore **90 cubic yards** of contaminated soil is anticipated.

### 3.5 Fuel Transfer Lines

Five percent of total volume is anticipated for this area as well. If the fuel line trench is excavated using 1 horizontal to 1 vertical sides to a depth of 9 feet, and a base width of 8 feet is required for the three lines, a total volume of 1333 cubic yards. Therefore **65 cubic yards** of contaminated soils is anticipated.

### 4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the data obtained from this and other investigations, the potential for encountering contaminated soil that will require special treatment and/or disposal methods is estimated to be relatively low under the apron portion of the project. Soils at the two existing pump houses where underground storage tanks are present have a very high potential for contamination. Soils at the above ground storage tank locations have a relatively high potential for contamination

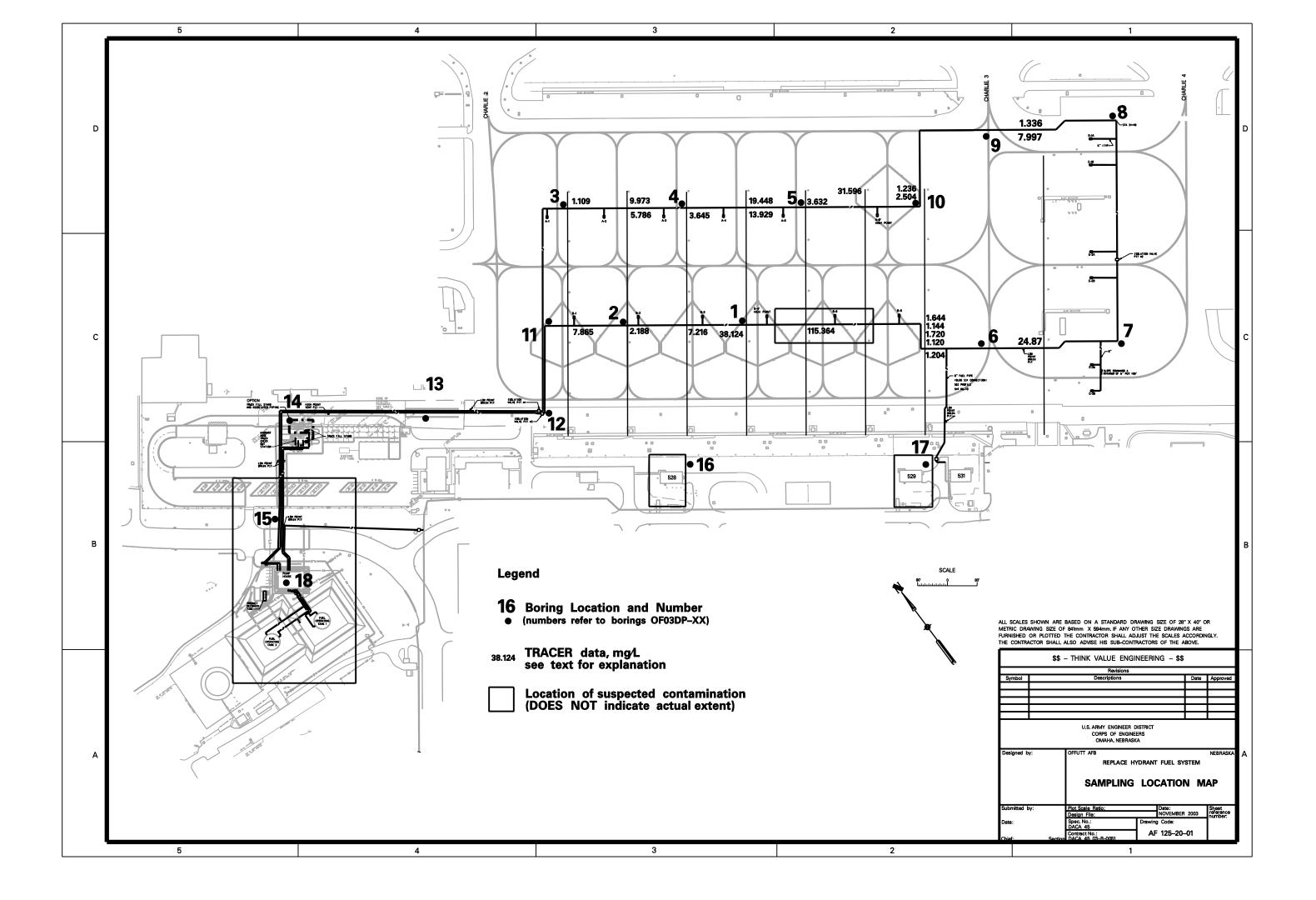
based on previous studies. Soils at the pump house and where fuel transfer lines extend from the pump house to the truck fueling stand have a moderate potential for contamination, however, these areas are anticipated to consist at least in part of rubble that will be unsuitable for use as structural fill.

A total of **3325 cubic yards** of contaminated soil are calculated based on the assumptions outlined above. Of that total, it is anticipated that **620 cubic yards** may be reused as backfill under the apron, yielding **2705 cubic yards** requiring specialized treatment and disposal. It must be borne in mind that the scope of this investigation was limited and only a very small percentage of the total excavation volume for the project was assessed, and that figure represents a best-guess estimate.

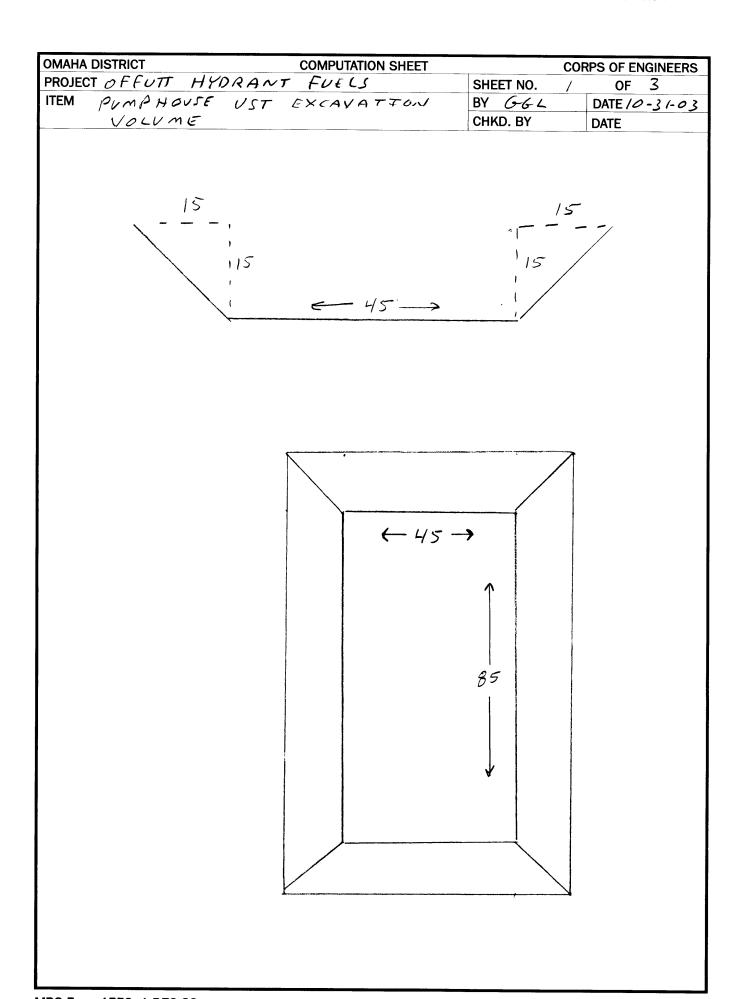
Several areas of construction for this project will likely encounter ground water, both contaminated and uncontaminated. Estimating the volume of water that will enter excavations is beyond the scope of this investigation as it involves many variables that are impossible to assess with available data.

Because of the relatively low cost of chemical analysis compared to treatment and disposal, and the limited extent of existing data on the site soils, it is recommended that a comprehensive program of testing be established to verify at the time of excavation that the soils require specialized handling rather than being arbitrarily placed into a specific waste stream. Sampling and screening with a volatile organic vapor detector is one method that may be used to potentially reduce the specialized disposal volume and also ensure that contaminated materials are not improperly disposed of.









OMAHA DISTRICT	COMPUTATION SHEET	COF	RPS OF ENGINEERS
PROJECT OFFUT HYDRANT		SHEET NO. 2	OF 3
ITEM PUMPHOUSE UST	EXCAUATION	BY 6-6-L	DATE 10-31-03
VOLUME		CHKD. BY	DATE

VOLUME OF EXCAVATION = 45 × 85 × 15 = 57,375 ft3 (BOTTOM FOOT PRINT TO 15 HEIGHT)

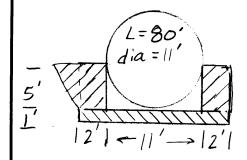
VOLUME OF SLOPED SIDEWALLS =

TOTAL EXCAVATION =

OF WHICH 622 yd3 is Contaminated

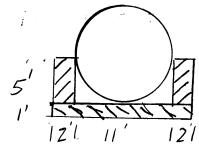
OMAHA DIS	OOM ONTO THE		CO	RPS OF ENGINEERS
PROJECT &	PEFUT HYDRANT FULLS	SHEET NO.	3	0F 3
	UMPHOUSE CONTAMINATED SOIL	BY G-GL		DATE 10-31-03
	KCAVATION VOLUME	CHKD. BY		DATE

### OUTSIDE TANKS



SUBTOTAL AREA = 41.25 F42

TWO UTSIDE TANKS: TOTAL = 82.5 FT



INSIDE TANK

SUBTOTAL AREA = 35 Ft? ONE INSIDE TANK

TOTAL AREA = (82.5)+(3.5) = 119.5 F+2

LENGTH OF EXCAUATION = 85 FT

.. VOLUME = (119.5)(85)= 10,157 F13 PER SIDE

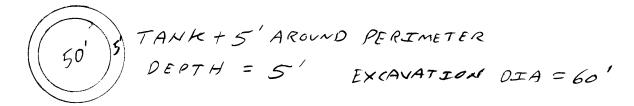
TWO SIDES :. PER PUMPHOUSE VOLUME

= 2(10,157) = 20,314 F13

= 750 yd3

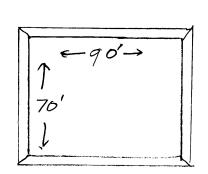
OMAHA DISTRICT	COMPUTATION SHEET	(	CORPS OF ENGINEERS
PROJECT OFFUT HYDE	ANT FUELS	SHEET NO.	OF /
ITEM EXCAVATION	VOLUMES AST, PUMPH	BY 66L	DATE /1- /-03
	1000 00 110 770 11	CHKD. BY	DATE

VOLUME OF AST EXCAVATION



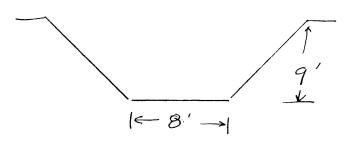
VOLUME = T(302)(5) = 14,137 ft3 PET tank

VOLUME OF PUMPHOUSE EXCAVATION



VOLUME = [(90)(70)(3+[1/2(6.5)(6.5)(346) = 48,260 f13

OMAHA DISTRICT C	OMPUTATION SHEET	C	ORPS OF ENGINEERS
PROJECT OFFUTT HYDRANT	FUELS S	HEET NO.	OF )
ITEM FUEL TRANSFER LIN	NE TRENCH B	1 GGL	DATE 11-03
EXCAVATION VOL	UME	HKD. BY	DATE



.. FOR 250' OF TRENCH (OLUME = (144)(250) = 36,000Fg?



### APPENDIX B

Chain of Custody Records



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U.S. ARMY CORPS OF ENGINEERS

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		ō	istrib	ution:	Distribution: Original Accompanies Shipment; Copy to	Shipment; Copy to Coordin	Coordinator Field Files	<b>9</b>				



## APPENDIX C

Sample Description Logs



### Sample Description Log

Hydrant Fuel System Contamination Investigation Offutt AFB, NE

	Drilling Agency		-		Page Pages	7
	Name of Priller	iaha			1 of $1$	
	Joe Morris	seu .			Size and Type of Sampler	
	Type of Drill Rig				Inspector Inspector	
	Simco 200		······································		Jennich Walters	
	concrete to	1.554	Handanasa	1	0 0	_
	Sample No.	Date	Headspace Results	Lab*	Sample Description	
	t		ppm		Sand (SP)	
(4-6)	0F03DP01-04	10-17-03	1.2		Dand (SP) no plastic, med. dense, slightly damp sultand pepper gray, fine-grained bottom 5.5-4.0' damp, finer grained	
(6.8)	0F03DP01-06	IO·17·03	0.0		as above, wet@_7.5ft. Sand(sp) no plastic, med. dense, damp to wet(~7.5ft), salt n pepper gray, fine.	·
(8.10)	0F03DP01-08	10.17.03	0.0		as above, heaving.  *heaved into rods and barrel during 8-10'run. locked into rods - collapse to 6.74	3
					Stopped due to heaving sand.	OUT.
			1			
Ĺ						

<sup>\*</sup> Check ( ) box if Encore sample was submitted to lab no Samples for Chem. one jar Sample Collected @ 8ft. - 10ft. V Squeeze up due to weight of concrete? duf. wet810' (note to self)

### Sample Description Log

Hydrant Fuel System Contamination Investigation
Offutt AFB, NE

	Drilling Agency USACE - On	naha			Page Pages of	
	Name of Driller.	sey			Size and Type of Sampler	
	Type of Drill Rig Simco 200	1			Inspector	
	Concrete 1		ick		Jen Wolbers	j
	Sample No.	Date	Headspace Results	Lab*	Sample Description	
(4-6)	OF03DP02-04	10.17.03	6.1		Sand (SP) no plastic, med. dense, damp, Saltana pepper gray, fine-grained	
(6.8')	0F03DP02-0b	10-17-03	0.0		Silty Sand (SP) no plastic, med. dense, moist, lower darkgray, very fine-grained minorclay	
(8-10)	0F03DP02-08	10-17-03	0.0		(asabove) but wetthroughout.	
					afterrun, sand squeezeduptolo.5 afterrodsout, depth 7.5ft. (Wet sana)	
					Stop-due to heaving sands	

<sup>\*</sup> Check (V) box if Encore sample was submitted to lab no chem samples collected due to wet Sand. took I jar sample 8-10!

Drilling Agency USACE-Omaha	Page Pages
Name of Driller .  Joe Morrissey  Type of Drill Rice	Size and Type of Sampler  Split Spoon
Type of Drill Rig Simco 2000 Earth probe	Inspector' Jen Wolbers

	Sample No.	Date	Headspace Results	Lab*	Sample Description
57	0F03DP03-05	10:15:03	ppm		Sand (SP) no plastic. Marin med dense, damp, satt n pepper grayi
10-12	0F03DP03-1D	10-15-03	0.0		fine-grained (wetn 6.54) as above, all wet throughout *prior torun, Sand heaved to 6.54.
15-17	0F03DP03-15	10.15.63	0.0		Sand (SP) no plastic, med. dense, wet, red-brown, fine-grained
					* collapse to 5.75ft after rods out.

<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab

Drilling Agency USACE - Omaha	Page Pages of
Name of Driller Joe Morrissey	Size and Type of Sampler  I" Split Spoon
Type of Drill Rig Simco 2004 Earthprobe	Inspector  Jen Wolbers

					<del>-</del>	•
	Sample No.	Date	Headspace Results	Lab*	Sample Description	
2-4'	0F03DP05-62	10.20.03	Ppm 3.1		Sand (SP) no plastic, dense, dry toslight damp Saltn pepper gray, fine- grained (small gravel 0.2'@ to	W
4-6	0F03DP05-04	10.20.03	0.0		as above	<b>や</b> ノ   
6-8'	0F03DP05-06	10.20.03	0.0		as above @ 6' becomesdamp @ 7.5', wet	*\J Si
					heaved to 6.6ft Stopped.	
					post pull collapse to 7.2 ft.	
Ĺ						

<sup>\*</sup> Check ( \sqrt{ ) box if Encore sample was submitted to lab

	Drilling Agency				Page Pages	1
	USACE - C	maha			of	
	Name of Driller	1550U			Size and Type of Sampler	
	Type of Drill Rig	13334 1 - m			I" Split Spoon Inspector	1
					Jen Wolber	
	concrete to	ン 1.32+			٥	J
	Sample No.	Date	Headspace Results	Lab*	Sample Description	
(4-6)	0F03DP0b-04	10.16.03	0.0		Sand(SP) no plastic, loose to mediciense, damp, rea-brown salt and pepper	
(6.8)	0F03DP06-06	10:16:03	0.0		Sand (SD) no plastic, medidense, wet (@~7.0) medibrown lgray, fine-grained (Stuck)	
					ydid not attempt	tD 6.65
						t06.65
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<sup>\*</sup> Check ( \sqrt{ ) box if Encore sample was submitted to lab

	Drilling Agency				Page Pages	]
	USACE - 0 Name of Driller	mana			of	
	Joe Morri	CCON			Size and Type of Sampler	
	Type of Drill Rig	3267			Inspector C	
	Simco 200	OOL			Jennifer Wolbers	
	Concrete thic	kness: 1	279		7 00 100 100 100	
	Sample No.	Date	Headspace Results	Lab*	Sample Description	
H-16	0F03DP07-04	16-20-03	0.0		Sand(SP) no plastic, med dense, slightly clamp saltnpepper, fine-grained (silty) (increasing dampness I wildepth)	•
8,10	0F03DP07- <b>08</b>	10.20.03	6.0		6-8 (as above but wet)	*jar sample 6-8'
-	0F03DP07-	Sw. 16.20.03			no attempt - in heaving sand.	collapse to 6.6ft after rods out,

<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab

	Drilling Agency CUSACE - CO Name of Driller.  Joe Morris Type of Drill Rig Symco 200 Concrete to 1	sey			Page Pages  of  Size and Type of Sampler  Split Spoon  Inspector  Cyn Wollow	
	Sample No.	Date	Headspace Results	Lab*	Sample Description	1
(4-6)	0F03DP08-01	10-16-03	bby		Sand (SP) Tow plastic, med. dense, moist, salt npeppergray, fine-grained (wet@ bottom ~al')	
(8.10°)	0 F03DP08-08	10-16-03			lost sample-spoon stuck. unable to retroeve	WL-6.4
	0F03DP68	10 16 03	_		Collapse to 6.4 feet bgs (watery sana) Stop-grouted hole.	W. 4
					, Jess Joseph Jo	

<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab

(2·4)	Drilling Agency USACE - O Name of Driller De Morri Type of Drill Rig Simc o 2004 Concrete-thi Sample No.	SSey CKness Date	Headspace Results	Lab*	Page Pages of 1  Size and Type of Sampler 1' Split Spoon Inspector Tennifer Wolbers  Sample Description  Sand (SP) no plastic dense, dry to slight damp tan wisalt n pepper, fine - grained	
(4-16)	0F03DP09-64	10.20.03	0.0		as above but damp tomoist (bottom very moist) Sandto 5.4ft. do not attempt - Sandup	Sample 4-6'
	OI 6 3 D F O T	10 20 03			heaving collapse to 5.5ft. post pullods	

<sup>\*</sup> Check ( ) box if Encore sample was submitted to lab

	Drilling Agency				Page Pages	ר
	USACE-(	<u>)maha</u>	<u> </u>		Page Pages	
	Name of Driller				Size and Type of Sampler	1
	Joe Morr Type of Drill Rig	12264	· · · · · · · · · · · · · · · · · · ·		1" split spoon	
	Simco 20	00			Jennifer Wolbers	
	concrete: 1		hick		Jennici Vyolbeis	J
	Sample No.	Date	Headspace	Lab*	Sample Description	7
			Results PPM			
2-4	0F03DP10-02	10.20.03	1		Sand (SP) no plastic, dense, dry to slightly dam Salt n pepper It tan, tine graine	P, d
مررن	0F03DP10-04	10.20.03	0.0		asabove. but damp	
6.8	OF03DP10-06	10.20.03	0.0		asabove, but wet @-69ft. Slightly coalsel-grained	*jar sample 6-8'
					collapse-67.05ft. post-pull	6-8
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<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab

## Sample Description Log

Hydrant Fuel System Contamination Investigation
Offutt AFB, NE

	Drilling Agency USACE - ( Name of Driller .  Joe Morri Type of Drill Rig	ssey			Page Pages  of  Size and Type of Sampler  I"Spli+ Spon  Inspector
	Simco 20 Concretet	OUR LINGS	C. 1 60	C.	Jen Wolhers
	Sample No.	Date	Headspace	Lab*	
(4.6)	0F03DP11-04		Results O.O	Lau	Sample Description  Sand (SP)  no plastic, med dense, damp to very damp (@^5.8')  It. brown, fine-grained
(6.8)	OF03DPI1-06	10-21-03	0.0		Sand(SP)  no plastic, med dense moist, It.gray, fine toveryfine-grained  07.7; sandy clay(Cc), med. plastic, med. stiff, damp. It.gray (too small for sample)
(8-10)	) OF03DP11-08	10-2103	0.0		no plastic, dense, wet, Hmed. gray, very fine-grained (pushed up to 7.4')
					water 7.2A. inrods collapse post-pull to 6.3A bgs

<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab

\* took jar sample 8-10ft.

Drilling Agency	Page Pages
Name of Driller .	Size and Type of Sampler
Joe Morrissey	I'l Split Spoon
Type of Drill Rig	Inspector Jennifer Wolbers

	Sample No.	Date	Headspace Results	Lab*	Sample Description
4-6	0F03DP12-04	10.21.03			Sand (SP) no plastic, med. dense, dryto slightly damp, tansath pepper, fine-grained (finer from 5.4+0)
6.8°	0F03DP12-06	10.21.03	0.0		Clay (CL) 6-7ft.  Med. plastic, soft to med. dense, damp  med. gray. some fines and Isitt  Sand (SD) 7-Bft.  no plastic, med. dense, damp, med. brown. f
8-10	0F03DP12-08	10.21.03	0.6	8.5.9.5	asabove to B.5ft. Clay(cc) med: Blastic, mea.stiff, damp, med.gray Situ Sand(50) Towplastic, med.dense, wet, light brown Fine Sand
					post-pull collapse to 9.2 ft.

<sup>\*</sup> Check ( \sqrt{ ) box if Encore sample was submitted to lab

	Drilling Agency USACE - On				Page Pages	7
	Name of Driller				Size and Type of Sampler	1
	Type of Drill Rig				I" Split Spoon Inspector	-
	Simco 2000				Inspector Wolbers 0-3	3'2
	Sample No.	Date	Headspace Results	Lab*	Sample Description	rysand ]
			2000		Sand (SP)	-
(4-6)	0F03DP13-04	10-17-03	0.0		no plastic, med.dense. Slight dam H. tan Salt n pepper, fine-graine	e. d
	0F03DP13-08				as above but moist wlacc. thin clay lenses	
(12-14)	OF03DP13-12	10.17.03	0.0		as above but wet w/ finer grain size (silty)	collapse
						post-pul)
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<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab

### Sample Description Log

Hydrant Fuel System Contamination Investigation Offutt AFB, NE

	USACE-Oma	ha			Page Pages	]
	Name of Driller				Size and Type of Sampler	
	Joe Morrissey				1"splitspoon	
	Type of Drill Rig	6			Inspector Jen Wolbers	
	no concrete		here-ni	A CITA	T Jen monder?	
	Sample No.	Date	Headspace	Lab*		1
			Results	Lau	Sample Description	
(4-6)	0FD3DP15- *04 08	10-16-03	0.0 ppm		Sand (SP) no plastic, loose tomed dense, damp, rea-brown, fine-grained (upper 0.4ft. has minorclay)	
(0,10	0=Q3DP15-XX	10.16.13	n.Oam	✓ <sup>¬</sup>	Clay(CL) +0.6ft (took sample here) mea.plastic, Stiff, damp, dark brown	B.6°
	*08				Clayey Sand (SC) I pw plastic, med dense, clive gray, very moist to wet, fine - grained (wet over	(bottom)
[14-16]	0F03DP15-12	10-16-03	O.Oppm		Sand(SP) Tow plastic, mea. dense, wet, olivegray, fine-grained, minor clay	~10ft.
						13.7
						post-pul

15-1017 =>14+016

<sup>\*</sup> Check (V) box if Encore sample was submitted to lab

\* adjusted Sample depths based on water levels@ hole 18 (@~124.)

instead of 5 to 7, took 4 to 6

"10 to 12 took 8 to 10.

USACE - Omaha  Name of Driller  Joe Marissey  Type of Drill Rig  Size and Type of Sampler  1" Split spoon  Inspector  Jen Wolbers  Concrete parkinglot by Fuels & 0.75 ft. concrete (restbrokenup)  Sample No.  Date Results  Pprh  Clay (CL)  med. plastic, med. stiff slightly damp, med. gray, with fine sand  Silt  Clay (CL)  med high plastic, med. stiff,  damp, dk. gray  Topo. 5 clay  Sand (Sp)  lew plastic, med. dense, wet, med  wet@ 12.5ft.		Drilling Agency						
Size and Type of Sampler  I split spoon  Inspector  Jen Wolbers  Concrete parkinglot by Fuels > 0.75 ft. concrete (restbrokenup)  Sample No.  Date  Headspace Results  Lab*  Sample Description  Clay (CL)  Med. Plastic, med. stiff Slightly clamp. med. gray, with fine sand 15 it.  (8-10)  OFO3DP14-08 10-17-03  OFO3DP14-12 10-17-03		Drilling Agency	aaha			Page	Pages	7
Joe Marissey  Type of Drill Rig Simco 2000  Concrete parkinglot by Fuels & 0.75 ft. concrete (rest-brokenup)  Sample No.  Date Headspace Results  Clay (CL)  Mea. plastic, med. stiff, slightly damp, med. gray, with fine sand silt.  (4-10)  OF03DP14-04 10-17-03 0.0  OF03DP14-08 10-17-03 0.0  (8-10)  OF03DP14-12 10-17-03 0.0  Topo. sclay  Sand (Sp) Topo. sclay  Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Topo. sclay  Topo. sclay  Sand (Sp) Topo. sclay  Sand (Sp) Topo. sclay  Topo. sclay		Name of Driller	laria					
Type of Drill Rig Simco 2000  Concrete parkinglot by Fuels > 0.75 ft. concrete (rest-brokenup)  Sample No.  Date  Headspace Results  Ppm  Clay (CL)  Med. Plastic, med. stiff, Slightly clamp, med. gray, with fine sand /silt.  (8-10)  OF03DP14-08 10-17-03  OF03DP14-12 10-17-03  OF03DP14-			SSeJ			Size and Type of Sampler		
Concrete parkinglot by Fuels > 0.75 ft. concrete (rest-brokenup)  Sample No. Date Headspace Results Sample Description  OF03DP14-04 10·17.03 0.0 Clay (cl)  med. plastic, med. stiff, Slightly clamp, med. gray, with fine sand Isilt.  Clay (cl)  med high plastic, med. stiff, damp, dk. gray  Clay (cl)  med high plastic, med. stiff, damp, dk. gray  Sand (sp)  10 0F03DP14-12 10·17.03 0.0 Sand (sp)		Type of Drill Rig				Inspector		
Concrete parkinglot by Fuels > 0.75 ft. concrete (rest-brokenup)  Sample No. Date Headspace Results   Lab*   Sample Description    (4-16) OF03DP14-04 10.17.03 0.0   Clay (CL)   mea.plastic, med.stiff, Slightly clamp, med.gray, with fine sand Isilt.  (8-16) OF03DP14-08 10.17.03 0.0   Clay (CL)   mea high plastic, med.stiff, damp, dl. gray    (12-14) OF03DP14-12 10.17.03 0.0   Sand (Sp)   10w plastic, med.dense, wet, med brown, tine-grained   Wet@ 12.5ft.		Simco 2000				Jon Walhers		
(4-16) OFO3DP14-04 10-17-03 O.D  (B-10) OFO3DP14-04 10-17-03 O.D  (B-10) OFO3DP14-08 10-17-03 O.D  (B-10) OFO3DP14-12 10-17-03 O.D		concrete po	rkingli	ot by Fue	1(2)	0.75 ft concepto (so	VIII a la ca	)
(4-16) OF03DP14-04 10.17.03 0.0 Clay (CL)  mea. plastic, med. stiff, slightly damp, med. gray, with fine sand 1silt.  Clay (CL)  mea. plastic, med. stiff, slightly damp, med. gray, with fine sand 1silt.  Clay (CL)  mea high plastic, med. stiff, damp. dk. gray  topo. schay  Sand (SP)  Tow plastic, med. dense, wet, med brown, fine grained wet 2.5?  Collapse to 12.7 pose		Sample No	Date	Headspace	7-1+			<b>)</b> 1
(4-16) OFO3DP14-04 10-17-03 0.0 med. plastic, med. stiff, Slightly clamp, med. gray, with fine sand silt.  (8-16) OFO3DP14-08 10-17-03 0.0 / Clay (cu) med high plastic, med. stiff, damp, dk. gray  topo.s. Clay Sand (sp) 10-17-03 0.0   Sand (sp) 1		Sample Ivo.	Daic		Lab*			
(8-10) OFO3DP14-08 10-17-03 O.O  Clay (cu)  Med high plastic, med. stiff,  damp.dk.gray  topo.sclay  Sand (sp)  low plastic, med. dense, wet, med  brown, fine-grained  wet@ 12.5ft.  Collapse  to 12.7 pos	`			pprh	1	Clay (CL)		1
(8-10) OFO3DP14-08 10-17-03 O.O  Clay (cu)  Med high plastic, med. stiff,  damp.dk.gray  topo.sclay  Sand (sp)  low plastic, med. dense, wet, med  brown, fine-grained  wet@ 12.5ft.  Collapse  to 12.7 pos	(11-16)	DEAZDON - OU	10 12 02	47		med. Dlastic med. S	stiff Slightly	
(8-10) OFO3DP14-08 10-17-03 O.O  Clay (cu)  Med high plastic, med. stiff,  damp.dk.gray  topo.sclay  Sand (sp)  low plastic, med. dense, wet, med  brown, fine-grained  wet@ 12.5ft.  Collapse  to 12.7 pos	(4)	01020814-01	10.17.03	7 U.C	j	dampined aray w	11th fine cand	
(8.10) OF03DP14-08 10-17-03 O.O \ \timed \text{Clay (cl)} \ \text{med high plastic, med. stiff, damp. dk. gray} \\ \[ \langle \text{Topo.5 clay} \\ \langle \text{Sand (SP)} \\ \text{12-14} \\ \text{0F03DP14-12 10-17-03 O.O} \\ \text{0F03DP14-12 10-17-03 O.O} \\ \text{10-17-03 O.O} \\ 10-17-0	•					/s. 11.	THE SUITE	
(8.10) OF03DP14-08 10.17.03 O.O mea high plastic, med. Stitt, damp, dk.gray  topo.sclay  Sand (Sp)  Tow plastic, med. dense, wet, med brown, time-grained we-13.5?  Wet@ 12.5ft.					,	01 /		-
(12-14) OFO3DP14-12 10-17.03 0.0  Sand (SP)  Tow plastic, med.dense, wet, med wi-12.5?  Wet@ 12.5ft.  Collapse  to 12.7 pos	( 10)					Cray (et)	ned stiff	:
(12-14) OFO3DP14-12 10-17.03 0.0  Sand (SP)  Tow plastic, med.dense, wet, med wi-12.5?  Wet@ 12.5ft.  Collapse  to 12.7 pos	18/01	0+03Db14-08	10.17.03	0.0		med high plastic	rica. Sirir	
(12-14) OFO3DP14-12 10-17.03 0.0  Sand (SP)  Tow plastic, med.dense, wet, med wi-12.5?  Wet@ 12.5ft.  Collapse  to 12.7 pos						uamp, air.gray		
Sand (SP) 10-17-13 0.0  Sand (						toposciay		
12-11 0F03DP14-12 10-17-13 0.0 Tow plastic, med. dense, wet, med wi-12.5? Wet@ 12.5ft. Collapse to 12.7 pos	,	<b>\</b>			!			
wet@12.5ft. Collapse to 12.7 pos	1,0-14	0E020014-12	10-17.03	6		Sana (SA)	nsp. wet. med.	111 13 67
Wet@ 12.5++. Collapse to 12.7 pos	11/	01035111 12	0 1, 6	0.0		brownifine - graine	d	MC-17.9.
pull rods						wet@ 12.5ft.		collapse
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<sup>\*</sup> Check ( ) box if Encore sample was submitted to lab

	Drilling Agency USACE	Omah	a		Page Pages of	
	Joe Mori	rissey			Size and Type of Sampler	
	Type of Drill Rig				Inspector Volbers	
	(on grass	)				I
	Sample No.	Date	Headspace Results	Lab*	Sample Description	
4-6	OF03DP16-04	10.21.03	0.0		Clayey Sand (SC) Tow plastic, med. dense, slightly damp, It tan I reatgray, very fine to fine - grained sand	
8.10	0F03DP16-08	10.21-03	0.0	<b>/</b>	Clay(CL), mea.plastic, med. Stiff, med.gray, some fine sand, damp (8-9.6)	
wex-13'	0F03DP16-12	10.21.63	0.0		Sana (SP), lowplastic, med. dense, ma as above to 13.0'	wiclay
					Sand (S.P) no plastic, med. dense, wet. It. brow	grained
					Callanca 12 10	(51 Hy) WC1304
					Collapse to 13.16t. after rods out.	
						ſ

<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab

	Drilling Agency				Page Pages	7
	USACE-Omaha				Page Pages of	
	Name of Driller Joe Morrissey				Size and Type of Sampler	
	Type of Drill Rig	-			1" split spoon	]
	Simco 200				Inspector Jen Wolbers	
	(grave) area)				Jen voller	]
	Sample No.	Date	Headspace Results	Lab*	Sample Description	
لبانة	0F03DP17-04	10.21.03	1872		Clay(cl). mea.plastic, med. stiff, damp, med. gray (no obvious odor)	
(8-10	0F030P17-08	10.21.03	popular ppm	(Sand)	(1.2'-1.8' Sand = strong odor) = 5.2 to 58 Clay (u) med. plastic, med. Stiff, damp, med.gray (no obvious odor)	* bgs Vsee Woelow
(12-14)	OF03DP17 - 12	10.21.03	0.0		Sand(SP) Towplastic, med. dense, wet. It. brown, veryfine-grained, Some Clay.	
					Collapse to 13.6ft. after rods out.	
					* Sand 5.2105.8, no plastic, med.dense, moist, salt npepper,	
					Fine-grained, strong petrol odor	
L						

<sup>\*</sup> Check ( ) box if Encore sample was submitted to lab

	Drilling Agency				Page Pages	7
	Name of Driller	maha		<del></del>	of lages	
	Joe Morris	Seu			Size and Type of Sampler	
	Type of Drill Rig			<u>-</u>	I" Split Span Inspector	-
	Simco 200				gen Wolber	<u> </u>
	(0.2'asphalt	7	111		O	J
	Sample No.	Date	Headspace Results	Lab*	Sample Description	]
(5.7')	OF 03 DP18-05	10.16.03	0.9 <sub>ppm</sub>		Clay(cr) Tow plastic, mea. sliff, darkgray- brown, slightly damp, occ. finesand, Some roots, occ. 1g. gravel	little
(10.12)	0F03DP18-10	10-16-03	0.0ppm	<b>✓</b>	Sandy Clay (cc) Tow-mea. plastic, soft, very most to wet, olivegray, fine-graineds and (samplest) Wet ~ 11.7ft.	Water enno @.9.81+ (Sandy zono ~3"+hick)
(15-17')	OF 03 DP18-15	10-16-03	0.0		Sand(SP) no plastic, loose to med. dense, wet med-brown, very fine to fine- grain-edsand	Collapsed to
						13.0ft. Water@12.9 ft.

<sup>\*</sup> Check ( $\sqrt{\ }$ ) box if Encore sample was submitted to lab



# APPENDIX D

Chemical Quality Assurance Report



### Appendix D: Chemical Quality Assurance Report

### Soil Analytical Results Offutt AFB Replace Hydrant Fuel System Pre-design

Sample ID	Result TPH/DRO mg/kg	Results VOC/GRO
OF03DP12-08	<10	VOCs ND
		GRO < 100 ug/kg
OF03DP14-08	<10	Acetone 14J ug/kg
		GRO < 100 ug/kg
OF03DP15-08	54*	Acetone 14J ug/kg
		GRO < 100 ug/kg
OF03DP16-08	<10	VOCs ND
		GRO < 100 ug/kg
OF03DP17-08	<10	Benzene 3.2 J ug/kg
		Ethylbenzene ND
		Meta/para-xylenes ND
		GRO < 100 ug/kg
OF03DP18-10	32*	Acetone 16J
		GRO < 100 ug/kg

\* C16-C25 light lubricating oil

ND = Non-detect

TPH = Total Petroleum Hydrocarbons

DRO = Diesel Range Organics

GRO = Gasoline Range Organics

VOC = Volatile Organic Compounds

mg/kg = milligram per kilogram

ug/kg = microgram per kilogram

J = Estimated value between the Method Detection Limit and the Reporting Limit

<u>Discussion of Results:</u> OF03DP15-08 and OF03DP18-10 had detections of TPH/DRO. The action level for soil that is considered clean for this project is 100 mg/kg TPH. Therefore none of the samples were above the clean-up standard. Acetone was detected in several samples at trace levels, but this is mostly likely a laboratory or sampling artifact. Gasoline Range Organics Petroleum Hydrocarbons were not found in any sample. A trace of benzene 3.2J was found in OF03DP17-08. Benzene is a compound found in fuels. None of the samples should be considered contaminated with Volatile Organics for purposes of this investigation.

<u>Chemical Quality Assurance</u>: When the Quality Control results have been received from the laboratory these shall be discussed.

# SERVING THE ARMY AND THE NATION

